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National Transportation Safety Board

Annual Report to Congress
1984

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The National Transportation Safety Board was established to "... promote transportation safety by conducting independent accident investigations and by formulating safety improvement recommendations."

Independent Safety Board Act of 1974.

Cover: Amtrak derailment, Essex Junction, Vermont, July 7, 1984.

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Washington, D.C.
July 1, 1985

To the Senate and House of Representatives:

The National Transportation Safety Board submits herewith its Annual Report to Congress for calendar year 1984.

The report is divided into individual chapters for aviation, highway, rail, marine, pipeline and hazardous material safety. Each chapter also includes the Safety Board's biennial appraisal, evaluation and review of transportation safety. In addition, the report includes appendices which list aviation accident statistics, accidents in all modes that were investigated or reported, and summaries of Safety Board responses to proposed rulemaking.

Jim Burnett, Chairman

Patricia A. Goldman,

Vice Chairman

G. H. Patrick Bursley, Member

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Foreword

The National Transportation Safety Board has a dual role under the 1966 statute that created it, and the 1974 act that conferred its complete independence. It is both the Federal government's transportation accident investigator, and the Federal "watchdog" of transportation safety.

The Department of Transportation Act of 1966, which set up the first cabinet-level agency for policy-making across all modes of U.S. transportation, created the Safety Board in the image of a respected civil aviation investigative agency—the Bureau of Safety of the Civil Aeronautics Board. The Bureau of Safety was a leader in unbiased, highly-skilled investigation of civil aviation accidents. The Congress saw a need not only to continue the Bureau's work, but also to extend it into all modes of transportation.

The 1966 Act thus transferred the Bureau of Safety to the new National Transportation Safety Board, together with the mandate for determination of probable cause of all U.S. civil aviation accidents. But the new Board also was charged with determining cause of carefully selected accidents in rail, highway, marine and pipeline transportation—those holding the most promise for developing answers to significant safety problems. And unlike the Bureau of Safety, the Board was to make its recommendations for safety reforms *publicly*.

The Independent Safety Board Act of 1974 established the Board as an entirely independent agency, divorced from the Department of Transportation even for the housekeeping services that DOT had provided it since 1966. The 1974 Act also increased the Board's surface transportation safety responsibilities.

In the decade after the 1974 Act, the Board investigated such catastrophic aviation accidents as the 1978 midair collision in San Diego, the 1979 DC-10 crash in Chicago, and the B-737 crash into the Potomac River in Washington and the B-727 takeoff crash in New Orleans, both in 1982. Its work in surface safety included investigations of the 1980 collision that sank the Coast Guard cutter Blackthorn in Tampa Bay, the collapse three months later of the Sunshine Skyway Bridge into Tampa Bay after it was struck by a freighter, the 1976 plunge of a charter school bus off a freeway ramp at Martinez, California; the 1982 hazardous materials derailment that forced evacuation of Livingston, Louisiana for two weeks; the 1983 collapse of a section of the Mianus River Bridge at Greenwich, Connecticut; and the 1983 natural gas explosion that destroyed a South Charleston, West Virginia supermarket.

The Board, in its role as Federal transportation safety advocate, also issued safety recommendations based on safety studies as well as accident investigations. It twice studied the effectiveness of the Federal Aviation Administration's air traffic control system in the wake of the 1981 controllers' strike. It was in the forefront of nationwide highway safety campaigns to raise the minimum drinking age to 21, and to require child safety seats, in all of the nation's 50 states. It sought Federal rulemaking prohibiting drinking by railroad crewmembers immediately before and during duty hours. It pressed for exposure suits as required equipment for all crewmembers of oceangoing vessels plying cold-water routes.

The range of safety issues was broad. But whether the Board was serving in its capacity as investigator or as safety watchdog, the purpose was the same:

"... to promote transportation safety ... by formulating safety improvement recommendations."

—Independent Safety Board Act of 1974

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Aviation Safety

Accident Statistics

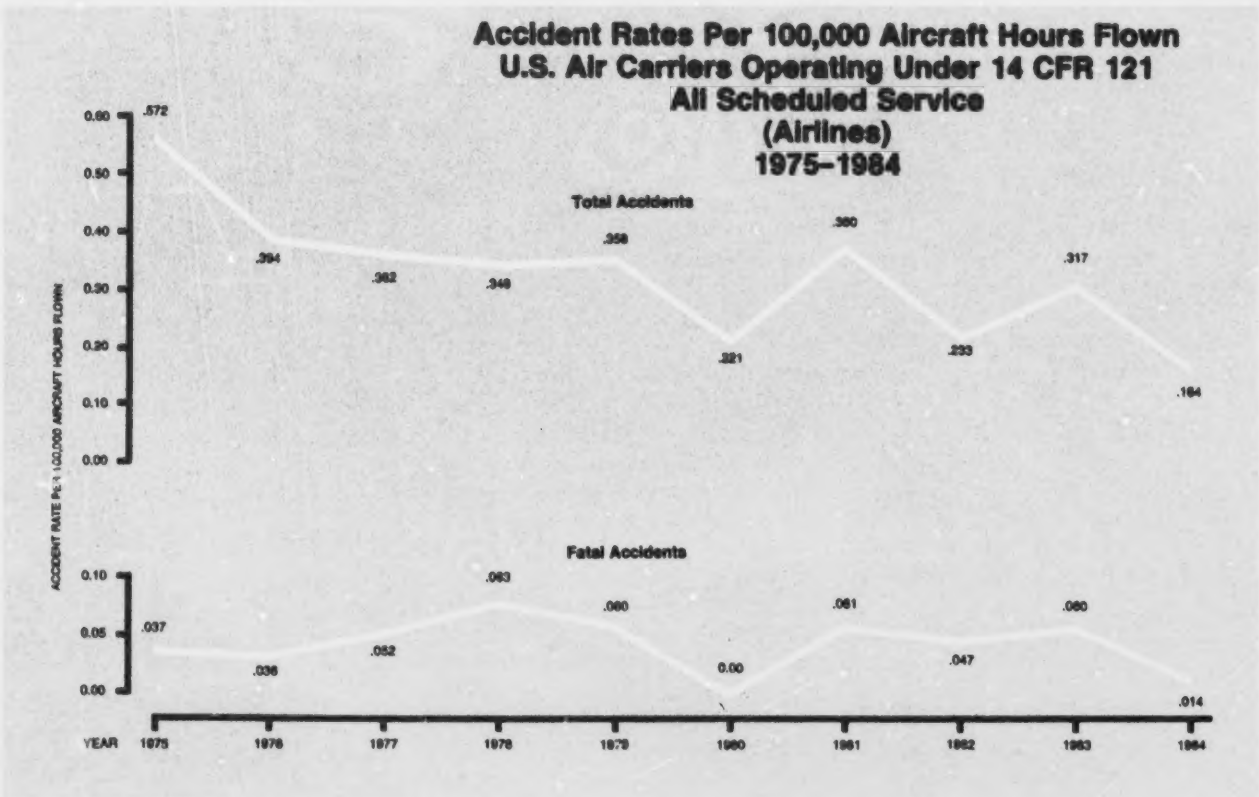
Throughout the jet age, U.S. airlines have drawn downward lines on the graphs of accident statisticians. In the last decade, fatal airline accidents have become so few that years, not months, pass between catastrophic crashes.

Calendar year 1984 was within such a period. There was only one fatal airline accident—the en route crash of a Zantop International Airlines Lockheed Electra on a cargo flight. Three crewmembers and a lone non-revenue passenger died in the accident at Chalkhill, Pa.

The result was a near-record-low rate of 0.019 fatal accidents in every 100,000 scheduled departures. This had been bettered only in 1980, when there were no fatal accidents in scheduled airline service.

There were only 12 accidents, fatal and non-fatal, in scheduled airline service last year. A record low, this produced a total accident rate of 0.224 per 100,000 departures. By comparison, the same rate was almost three times higher—0.659—in 1975.

By the end of 1984, there had not been a catastrophic crash of U.S. turbojet airliner since the July 9, 1982 takeoff crash of a Pan American B-727 at New Orleans. That period of nearly 30 months marked the second time since 1979 that the airlines had



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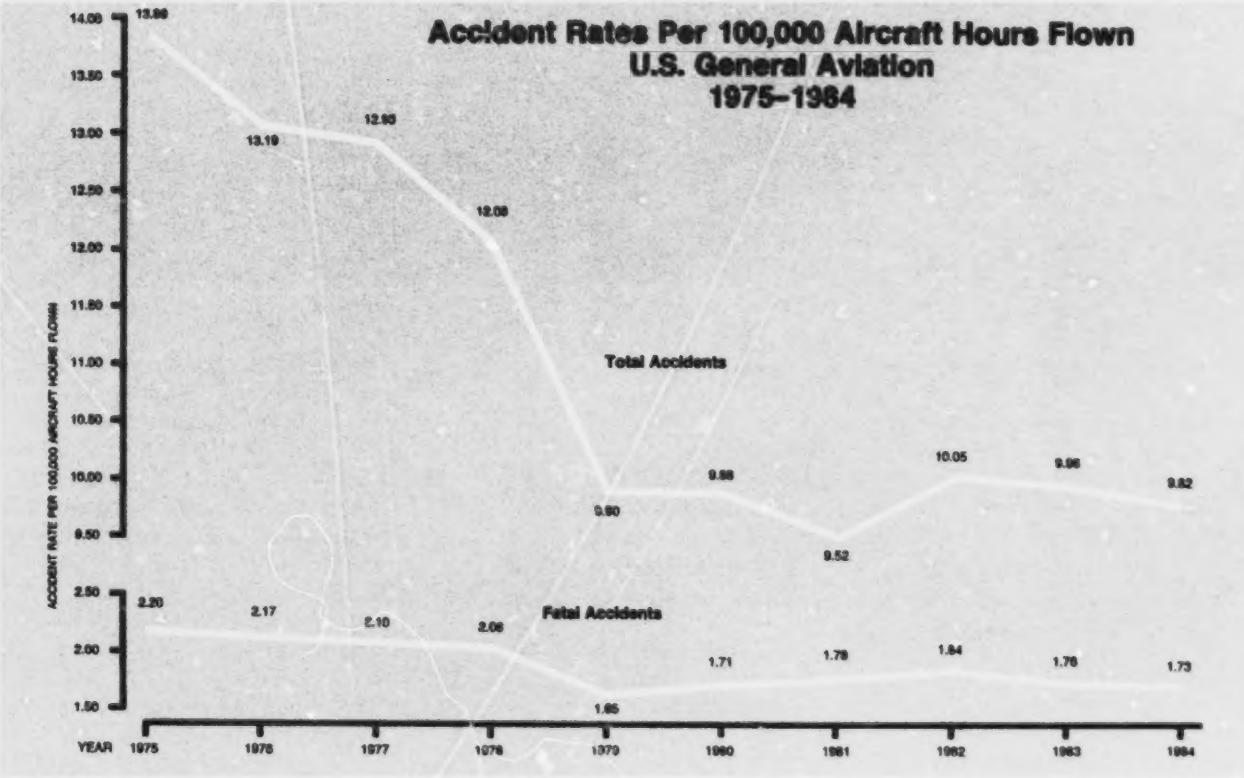

operated for more than two years without a catastrophic crash of a jet airliner.

The earlier record—unprecedented at the time—had been established in the 26 months between a Western Airlines DC-10 landing crash at Mexico City on Oct. 31, 1979, and the Air Florida takeoff crash at Washington, D.C. Jan. 13, 1982. Before that time there had never been a single calendar year without such an accident.

Unfortunately, the airlines' 1984 achievement was less than one day old when Eastern Airlines' crash of a B-727 on New Year's Day near the top of an Andes mountain outside LaPaz, Bolivia, wrote a tragic finish to the 30-month record. A team of Safety Board investigators, at the request of the Bolivian government, travelled to LaPaz to assist in the investigation. But with wreckage inspection or recovery impossible, and retrieval of the cockpit voice and flight data recorders questionable, prospects for determining cause were poor.

All other segments of U.S. civil aviation except commuters also recorded improved accident records in 1984. With seven fatal accidents, the commuters' rate of 0.26 fatal accidents in every 100,000 departures was a sharp increase over the 1983 rate, which had been a record low. Yet the 1984 rate still was well below the commuters' fatal accident rates in 1975-81. The fatality toll last year was 48; it was 11 in 1983.

On-demand air taxis achieved substantial reductions in both total and fatal accident rates. Their

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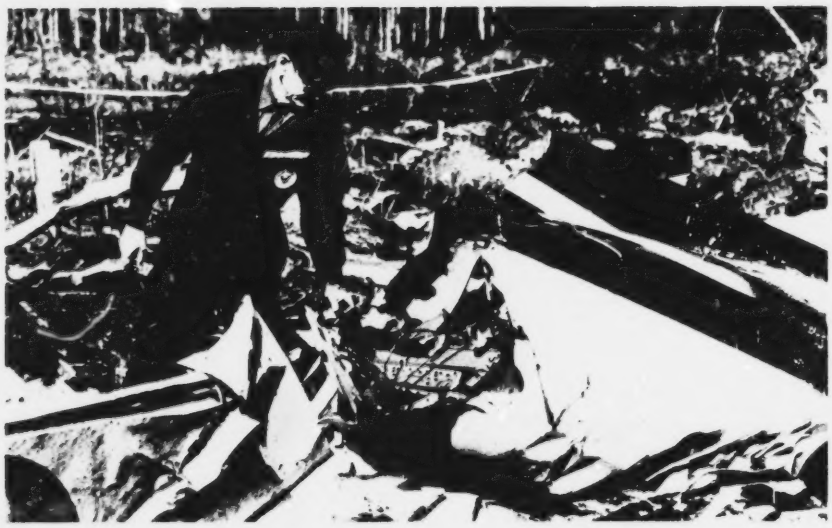

A Safety Board aviation "structures" specialist examines the tail of a Provincetown-Boston Airline commuter plane that crashed after takeoff at Jacksonville, Fla. on Dec. 6, 1984. *AP/Wide World photo*

140 accidents produced a total accident rate of 4.21 per 100,000 hours, a 25 percent reduction from 1983. With 22 fatal accidents, the fatal accident rate was 0.66 per 100,000 hours, down 39 percent. Fatalities totaled 51 as compared with 62 in 1983.

General aviation—all other civil flying—recorded slight decreases in rates. With 2,999 accidents, 529 of them fatal, the 1984 total and fatal accident rates in every 100,000 hours were 9.82 and 1.73 respectively—both less than 2 percent below 1983 rates. The fatality toll of 998 was a 4.6 percent reduction from the 1,046 of 1983.

Midair Collisions

Since the National Transportation Safety Board's inception in 1967, the threat of midair collisions has been as persistent and stubborn a safety problem as any the Board has addressed.

The Board was less than four months old when a Piedmont B-727 and a corporate twin-engine plane collided at 6,100 feet as the airliner was climbing out from the municipal airport at Asheville, N.C., July 19, 1967. All 82 persons aboard the two planes died in the collision, ground impact and post-crash fire. The Board's investigation showed that the corporate pilot had deviated from his air traffic control (ATC) clearance, and the Board recommended that the Federal Aviation Administration (FAA) require annual proficiency flight checks for all instrument-rated pilots.

Two years later, on Sept. 9, 1969, another collision highlighted the growing difficulties in terminal area ATC. An Allegheny DC-9 and a single-engine private plane collided at 3,550 feet just after the airliner emerged from the base of a layer of broken clouds on its descent to Indianapolis, Indiana. All 84 occupants of the planes died in the accident. This time the Safety Board found that the airline flightcrew and the student pilot of the light plane were following their respective instrument and visual flight plans, but that the broken clouds prevented either from seeing the other until seconds before impact.

The Safety Board held that the collision had been caused by "deficiencies in the collision avoidance capability" of FAA's ATC system when instrument and visual flights were mixed. The "see-and-be-seen" concept of collision avoidance, "which has been demonstratively deficient in the past, is now totally unacceptable in providing separation between aircraft during descents into terminal areas where high-and-low-speed traffic is intermixed" under instrument and visual control, the Board found.

The 1969 Indianapolis midair collision was one of 13 involving

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airliners and general aviation aircraft in the seven-year span of 1966-72. In the 12 years since that time, a period which saw the creation of terminal control areas and enhanced radar detection capabilities, there has been only one. That, however, was the nation's worst—the 163-fatality collision and crash involving a Pacific Southwest Airlines B-727 and a light plane on the airliner's approach to San Diego's Lindberg Field on Sept. 25, 1978. Again, the airline crew and the light plane's two pilots were responsible for seeing and avoiding each other.

The Safety Board held that the PSA crew had failed to follow their clearance to maintain visual separation from the aircraft that had been reported to it. The Board also criticized procedures that authorized controllers to give such a clearance when they could have given either aircraft actual lateral or vertical separation. The Safety Board's recommendations to FAA revealed that the problem raised at Indianapolis had not been fully solved. The Board sought further reduction in FAA's use of visual separation in all terminal areas, whether or not they were protected by terminal control or terminal radar service areas.

In 1975 the near-collision of two wide-body jetliners near Carleton, Michigan at 35,000 feet imperiled 319 persons. Only an evasive maneuver by one of the pilots prevented what would have been the nation's worst domestic airline crash.

New Year's Day 1984 brought a harrowingly similar new catastrophe. Two hundred nautical miles out over the Atlantic east of Miami, two Pan American wide-body jetliners—a DC-10 with 330 persons aboard and a B-747 with 166 aboard—were flying at 37,000 feet. It was the altitude to which both had been assigned. The area was beyond ATC radar coverage. Their combined approach speed was about 840 knots. The DC-10 flightcrew saw the 747 and took evasive action. This may well have prevented a collision; Board reconstruction of the two flight paths showed the jumbo jets had come within 300 feet of each other.

Although it investigates only a tiny fraction of all reported near-midair collisions, the Safety Board made a full-fledged investigation of the Pan American case, as it had done in 1975, because of its catastrophic potential. The Board found that:

—Coordination of the two flights' altitude clearances probably had been disrupted by one controller relieving another.

—Four controllers could have observed the potential conflict from information on "flight progress strips" in the Miami Air Route Traffic Control Center (ARTCC).

—Miami center controllers had been working an average of 46 hours a week for the previous six months, and a 64-year-old controller involved in the handling of the two aircraft had worked six-day weeks during seven of the previous nine weeks.

The Safety Board on July 16 issued new recommendations seeking to strengthen recurrent training of controllers in thorough briefing of those relieving them, and to improve Miami Center communications and radar coverage.

The Board also reiterated 1983 recommendations to FAA that it take interim steps to help ATC supervisors detect controller stress and fatigue, and expedite the longer-range detection program being developed by its Office of Aviation Medicine. Controller stress and fatigue were primary concerns of the Board in its 1982 and 1983 reports on system-wide studies of the post-strike ATC system.

The perilously close Pan American near-collision would prove to be only the first in an unusual series of such incidents. From May to September, there were seven near-collisions sufficiently serious to warrant Safety Board investigation. The first, on May 9, was cause for particular concern.

Near a central Pennsylvania navigation facility called the Philipsburg VORTAC, a corporate

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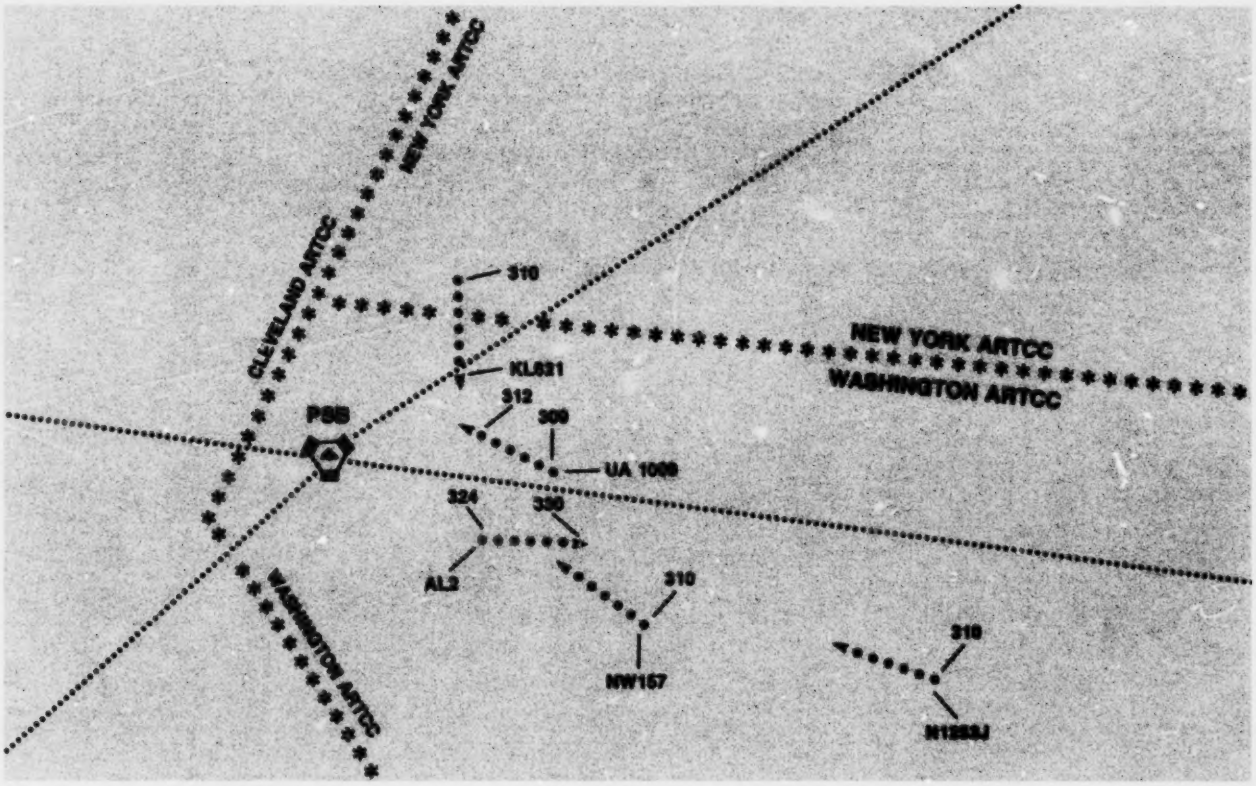

jet and four airliners, one of them a B-747, were involved in four separate ATC "conflicts"—not actual near-collisions, but instances of less than the FAA-prescribed minimum separation of 2,000 feet vertically and/or five miles laterally. Four of the aircraft had ATC clearance at 31,000 feet; one was climbing through that altitude.

The 747, a KLM flight from Amsterdam to Atlanta, was cruising on a southeast course under the control of the New York center. It flew too close to three westbound aircraft—a United Airlines B-737, a Northwest Airlines B-727, and a corporate Cessna Citation. All three were under control of the Washington ARTCC. The least separations were one mile, horizontally, between the 747 and United's B-737, and 580 feet, vertically, between the 747 and Northwest's 727. The United plane also came within 1.2 miles, horizontally, of a northeastbound USAir B-737 that was climbing to its cruise altitude of 33,000 feet under control of the Cleveland ARTCC.

Safety Board investigation showed that a New York ARTCC controller had attempted, but was unable to complete, an automatic radar "handoff" of the KLM 747 to the Washington center. The Washington sector controller, working heavy traffic and preoccupied with a conflict developing between the United and USAir airliners, told another controller working with him that "KLM is

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Hazardous paths: Radar data on the five airplanes involved at Philipsburg. Each path represents one minute of flight, and is identified by flight number. Three-digit numbers are altitudes in hundreds of feet.

not going to fit, tell (New York) to (turn him back)." That controller was unable to do so immediately, and lost valuable time when he mistakenly contacted the Cleveland center when he did try to alert New York to the developing conflicts the 747 was posing.

The Safety Board, in issuing recommendations to FAA on Nov. 9, 1984, said the Washington sector's traffic was "nearing (the) saturation level." It said continued "unrestricted access to the Air Traffic Control system without an effective means of predicting and preventing peak period saturation will lead to more operational errors and possibly accidents." In its recommendations, the Board said FAA should take "interim measures" to control access to the system, and expedite its en route sector loading prediction program—a computerized system for real-time flow control throughout the country.

FAA had not responded to the recommendations at year's end.

Airplane Fire Safety

In a span of less than four years in the early 1970s, the Safety Board investigated half a dozen airline post-crash or inflight fires. The resulting series of safety recommendations sought a number of improvements—particularly in detecting and fighting inflight lavatory fires, and in helping passengers to evacuate smoke-filled cabins.

It was to be a decade or more before one particularly dramatic inflight fire and crash landing brought action on Board proposals.

On Nov. 27, 1970, a Capitol military charter flight crashed at Anchorage when unwanted braking prevented the DC-8 from lifting off the runway. The plane remained relatively intact, but the cabin was gutted by an intense post-crash fire. Forty-seven of the 229 persons aboard died in the fire.

In its March 1972 accident report, the Board called for a government-industry effort, using "already extensive research and accident investigation data," to make major improvements in the design of airliner interiors. Among safety advances that were particularly needed, the Board said, was the improvement of flammability characteristics of cabin interior materials.

Nine months later, at O'Hare International Airport, two airliners collided as one taxied onto the runway being used by the other for its takeoff. The airliner on takeoff roll, a North Central DC-9, was destroyed by the impact and post-crash fire, but investigators found that four of the 10 fatally injured passengers apparently tried but were unable to find their way out of the dark, smoky cabin.

Among recommendations in the Board's August 1973 report was a call for "more efficient methods of indicating the location of emergency exits," including improved visual guidance and some form of "tactile"—by touch—guidance when darkness and smoke prevent the use or hamper the effectiveness of lighted exit signs. The Board suggested that a new solution to the problem might be floor-level lighting.

In July 1973, the Safety Board assisted French authorities in their investigation of the crash landing of a Varig B-707 near Paris after a fire had broken out in a rear lavatory. Two months later, the Board called on FAA to require smoke detectors or frequent inflight checks of lavatories by fight attendants for early detection of fires.

Another inflight fire, this time involving a Pan American B-707 cargo flight, occurred on Nov. 3, 1973. And in the summer of 1974, two more airliner lavatory fires, both non-fatal, prompted the Safety Board to recommend specifically that FAA require installation of automatic-discharge fire extinguishers in lavatory waste paper containers in all airliners. The recommendation was issued Dec. 5, 1974.

FAA at first only encouraged—and only later required—the airlines to prohibit smoking in lavatories. The agency also urged routine flight attendant inspections

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of lavatories before takeoff, and periodically during flight. But the goals of these and other Safety Board fire safety recommendations still were largely unrealized a decade later when the jet era's most dramatic inflight fire emergency arose at 33,000 feet over Kentucky on June 2, 1983.

The fire aboard Air Canada's McDonnell Douglas DC-9 began in the area of the aft lavatory, and burned undetected for almost 15 minutes. When it was found, extinguishing efforts by the crew were unsuccessful. An emergency landing was made at Greater Cincinnati Airport, but by this time the fire had spread into the cabin ceiling, filling the passenger cabin with smoke, toxic fumes and heated gases. When the plane came to a stop, visibility in the cabin was almost non-existent more than a foot above the cabin floor.

Twenty-three passengers and crewmembers were able to evacuate the burning airliner. Twenty-

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Air Canada's stricken DC-9 on Greater Cincinnati Airport in June 1983 after it made an emergency landing because of an inflight cabin fire. Twenty-three occupants escaped from the burning plane; 23 did not.

three others, all passengers, died in the fire.

In its Air Canada accident report on Aug. 8, 1984, the Safety Board said it had been unable to determine the exact origin of the fire. But the Board did review its prior fire safety recommendations, and FAA's responses to them. It noted recommendations it already had made during the Air Canada investigation for various airliner lavatory inspections, and issued new recommendations in the accident report seeking improved detection measures and more aggressive firefighting techniques when in-flight fires occur.

Less than six months after the Air Canada inflight fire, FAA issued notices of proposed rulemakings on fire safety (NPRM 83-14 and 15).

NPRM 83-14 proposed requirements for use of "fire-blocking" material in seats of airliners certificated in the future, and for retrofit of previously certificated airliners after a three-year grace period. NPRM 83-15 proposed escape path markings or lighting close to cabin floors, with a two-year grace period. Final rules by FAA were announced by Transportation Secretary Dole on Oct. 23, 1984.

On May 17, 1984, FAA's NPRM 84-5 proposed requirements for installation of (1) smoke detector systems in all airliner lavatories and galleys; (2) automatic fire extinguishers in each lavatory disposal receptacle; and (3) at least two hand fire extinguishers, employing the advanced extinguishing agent Halon, in each airliner cabin. The rulemaking was close to completion by FAA at year's end.

General Aviation Crashworthiness

Steady progress in U.S. civil aviation safety over a quarter of a century, at least as measured by accident statistics, has tended to obscure a few important areas in which progress has been slow—if any. The crashworthiness of the general aviation airplane—the chances of survival when it crashes—is one of these.

While the benefits of jet engines, weather and traffic control radar, flight simulators, better instruments and improved pilot training were having a cumulative effect on all of civil aviation, technology provided virtually no advance in general aviation crashworthiness.

Recommendations for improved general aviation crashworthiness date back to the Safety Board's predecessor agency, the Bureau of Safety of the Civil Aeronautics Board. The Safety Board picked up the campaign in 1970 and reinforced it with recommendations in 1975 and 1981.

Fuel tanks and fuel systems that are far less likely to produce post-crash fire have been in use in Army helicopters for 15 years. Significant advances have been made in seat and restraint system design and testing. FAA has played a role in some of these improvements, yet little of this technology has been incorporated in general aviation airplanes.

In 1981, the Safety Board conducted a broad study of general aviation crashworthiness. The Board found that . . .

—General aviation plane occupants unnecessarily are killed in crashes that should be survivable, and most deaths and serious injuries result from inadequate restraint systems, and from cockpit and cabin design.

—Most of the available and effective occupant crash protection features can be built into general aviation planes at little or no extra cost to the manufacturer.

—Although FAA research has found ways to improve crashworthiness, general aviation manufacturers have not made effective use of such findings or employed human and systems engineering principles extensively in their aircraft design work.

—FAA standards for seats and seat attachments long have been outmoded—they have not

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been changed since 1949—and there is a particularly pressing need for dynamic testing.

In fact, the Safety Board concluded from its study that the crashworthiness of the general aviation airplane was inferior to that of the U.S. automobile.

FAA's response to the repeated calls for regulatory reform was consistent. It said it could not tighten crash protection requirements because no one could define, with specific values, the "typical crash environment." In 1982, the Safety Board began an ambitious project to do just that.

Phase One of this project was completed in June 1984 with Board adoption of a report detailing the program and the investigative methods that could be used to define the typical crash environment. As 1984 came to a close, a Phase Two report was in its final stages. It defines, for the first time, the limits of survivability in crashes of modern general aviation aircraft. Using data from 40 to 50 special accident investigations, and from crashworthiness data from hundreds of other

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One of the Board's general aviation crashworthiness study accident airplanes. One died; two were injured seriously. The investigator's finding: Had available shoulder harnesses been used, all would have been injured only slightly.

crashes, the report defines limits of survivability by impact and angles—75 knots at 0 degrees, 60 knots at 45 degrees, and 45 knots at 90 degrees. The report demonstrates also that there are 20 percent fewer fatalities and 88 percent fewer serious injuries when shoulder harnesses are used.

By mid-1985, in its Phase Three report, the Board expects to provide the exact numbers FAA has insisted it must have. Thirty to thirty-five of the specially-investigated accidents provided Board specialists with the information to calculate "crash pulses"—the duration and magnitude of G-forces—with which FAA regulators and industry designers can determine both effective and economically feasible crashworthiness improvements.

Calendar year 1984 brought other progress, as well. FAA conducted a small aircraft airworthiness review in St. Louis in October. The General Aviation Manufacturers Association (GAMA) petitioned FAA for action requiring shoulder harnesses for rear seats as well as front in all newly manufactured aircraft. FAA's 1978 harness regulation had covered only front seats. GAMA members also pledged to begin rear-seat installations voluntarily on January 1, 1985. Another industry group added its support for the Safety Board's recommendations for dynamic testing.

After 17 years of frustration on the issue, the Safety Board and its general aviation crashworthiness specialists were confident that 1985 will prove to be a significant turning point.

Small Airlines' Maintenance

Investigations of two accidents involving a small airline and a commuter operator prompted the Safety Board last year to urge FAA to keep a particularly sharp eye on maintenance procedures to be sure that maintenance work and inspection of it are done by separate units of the carrier, and maintenance problems are reported promptly by pilots.

The Board's action came in its report on March 13 of a commuter plane crash landing that was caused by an improper and unsecured control linkage bolt, and its continuing investigation of the crash of a small airliner whose flightcrew pressed on toward their home field despite loss of all but emergency battery power.

The crash landing involved a Sierra Pacific Airlines deHavilland DHC-6 commuter flight at Hailey, Idaho, on February 15, 1983. The plane was on final approach when its elevator control linkage became disconnected, depriving the pilot of vertical control. Both pilots and five of their six passengers were seriously injured in the crash landing.

Safety Board investigation showed that Sierra Pacific maintenance personnel had installed an improper bolt, and had not secured it. The carrier's maintenance director had supervised both the maintenance work and the inspection, mingling the two functions to the point that an inspection that would have disclosed the improper bolt "was never performed," the Board concluded.

The Board cited as contributing factors in the accident the airline's failure to "provide the required separation . . . between maintenance and inspection functions," and FAA's failure to detect it.

The same lack of separation was found by the Board in its investigation of the nighttime crash of an Air Illinois HS-748 airliner en route from Springfield to Carbondale, Illinois on October 11, 1983. The flightcrew did not turn back to Springfield when all regular electric power was lost a few minutes after takeoff, but continued toward its destination some 130 miles away. The flight crashed at

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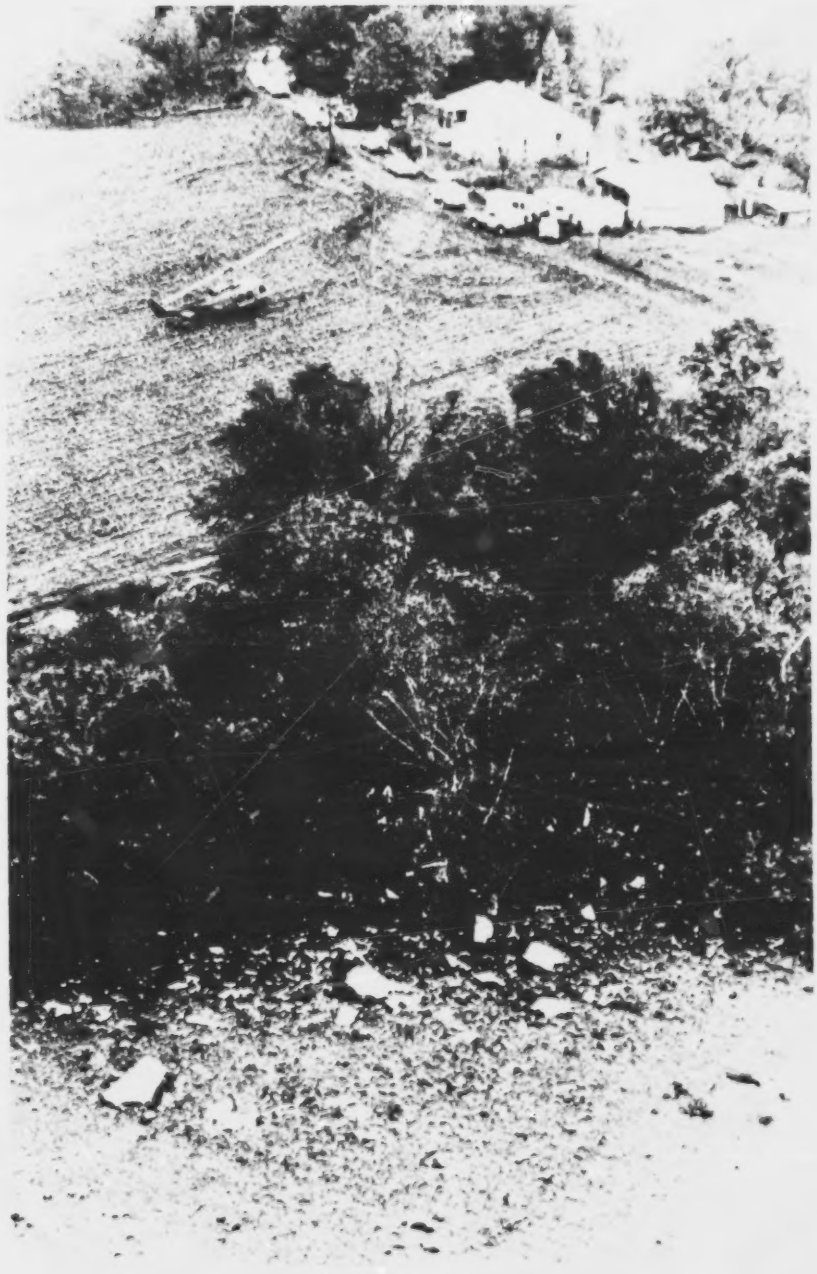

Fragmented wreckage of an Air Illinois airliner litters the fields and trees of Pinckneyville, Illinois. Nearby is the command post of emergency forces. The plane crashed Oct. 11, 1984 on a nighttime flight from Chicago to Carbondale, Ill. *(AP/Wide World photo)*

Pinckneyville, 25 miles short of Carbondale, the airline's maintenance base, when emergency battery power ran out and instrument references were lost. All ten persons aboard were killed.

Although the failure to divide maintenance work and inspection was not found to be a factor in the accident, investigators did find the problem at the Air Illinois base, and it did pose possible "compromises that could jeopardize the safety of flight," the Board said. Testimony at the public hearing also disclosed pilots' routine failures to log mechanical irregularities after flights—a practice that the Board said should have been detected and corrected by FAA inspectors checking Air Illinois maintenance.

The Board urged FAA to issue bulletins emphasizing to its inspectors the regulatory requirements for separation of maintenance and inspection functions, and for prompt recording of all mechanical problems in aircraft maintenance logbooks. FAA said it would issue a notice to alert its inspectors.

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The Safety Board's investigation of the Air Illinois accident also disclosed deficiencies in both the maintenance and operations inspections conducted by FAA prior to the Pinckneyville crash.

Principal maintenance inspectors did not see that part inspections were not being made within required intervals, and did not discover that life-limited plane components were not being removed and replaced within the required time limits.

The principal operations inspector testified he could not recall observing Air Illinois teaching or demonstrating its failure-of-both-generators checklist during his three years as its principal inspector. This suggested that Air Illinois recurrent training neither addressed nor emphasized the specific emergency that was involved in the Pinckneyville crash—an omission that the FAA inspector should have detected during his surveillance inspections.

The Safety Board found that, in general, FAA surveillance of Air Illinois before the accident was not of sufficient depth to detect numerous areas of non-compliance with company procedures and Federal regulations. Furthermore, the first phase of FAA's post-accident surveillance of the carrier failed to develop shortcomings that later were cited in a final investigation that recommended revocation of the Air Illinois operating certificate.

The Safety Board was close to adoption of its Air Illinois report at year's end, and it already was planning a study in 1985 of the adequacy of FAA surveillance of the safety of both airline and commuter operations.

Alcohol in Aviation

Aviation accident investigators of both the Safety Board and its predecessor agency, the Bureau of Safety of the Civil Aeronautics Board, have been skeptical for years of the accuracy of any measurement of the pervasiveness of alcohol in aviation by the frequency with which it had been cited in the probable cause of accidents. As recently as 1981, the Safety Board's own statistical analysis showed alcohol as a cause or factor in only 1.3 percent of all general aviation accidents, and 5.7 percent of fatal general aviation accidents, in that year.

In 1977, after a private pilot tried to land his light aircraft in Baltimore's Memorial Stadium shortly after a football game, the Safety Board had recommended that FAA establish a blood alcohol level at which a pilot would be legally "under the influence" of alcohol, and to make a pilot's application for a license "implied consent" to future testing for alcohol.

In May 1984, the Board issued the results of a statistical study that clearly confirmed what investigators long had suspected: Alcohol involvement is a larger problem in general aviation than had been suggested by official determinations of accident cause.

Using fatal accident data from 1975 through 1981, the Safety Board found that 10.5 percent of the conclusive toxicological tests of fatally-injured general aviation pilots showed alcohol in their blood. Forty-five percent of the pilots in alcohol-involved accidents had blood alcohol levels of more than .15—a level considered by experts to be one major indicator of alcohol abuse.

There was no alcohol involvement found in any accidents of scheduled service airlines flying large aircraft. But of post-mortem tests made of pilots in commuter and "air taxi" accidents, 6.4 and 7.4 percent, respectively, showed alcohol.

The Safety Board noted in its study report that although FAA in 1981 had issued proposed rulemaking that would set a .04 blood alcohol threshold for civil aviators, and would impose an implied consent rule, more than two years had elapsed since the comment period had been closed.

The Board held that any alcohol level in a pilot is "unacceptable," and that FAA should adopt a limitation at the lowest possible blood alcohol level, given the tolerances of testing technology. The lack of a specific level defining "under the influence" makes prevention and enforcement ef-

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Alcohol involvement in all aviation accidents:
1975 through 1981

	Total	1981	1980	1979	1978	1977	1976	1975
All accidents	26,849	3,715	3,820	4,061	4,498	4,306	4,217	4,232
Fatal accidents	4,947	707	675	687	794	706	704	674
Conclusive toxicology tests*	3,536	524	481	500	553	506	494	478
Positive alcohol tests	358	55	60	39	54	48	52	30
Percent positive	10.1	10.5	12.5	7.8	9.8	9.5	10.5	10.5
Other known alcohol-involved accidents**	102	9	5	8	18	24	19	19
Total alcohol-involved accidents	460	64	65	47	72	72	71	69

*Samples were adequate for testing for alcohol, and appropriate testing was performed. Toxicological tests are not always possible.
**Fatal and nonfatal accidents in which alcohol involvement was determined from witness statements.

forts "more difficult," the Board said, and an implied consent rule would help to measure alcohol use in aviation more accurately and "serve as a general deterrent to flying after or while drinking."

In its response to the Safety Board's renewed alcohol recommendations, FAA said that although it agrees that pilots should have no blood alcohol while flying, the level at which impairment "can be scientifically shown is .04 percent."

As for an implied-consent rule, FAA said it would be "impractical" to equip and train its inspectors to conduct alcohol tests of surviving pilots at the scene of an accident or incident. As a possible approach to such "practical difficulties" in implied-consent enforcement, FAA said it was considering a rule that would depend on "local law enforcement organizations" for enforcement.

The agency's response to the Board on its alcohol rulemaking was made in October 1984. At year's end, a final rule still had not been issued.

Airport Safety

In contrast with airplanes and airmen, federal regulation of airports dates back only to 1972, when FAA, under new statutory authority, began its airport certification program. Last year, the Safety Board reported its assessment of that program by means of a special study of 14 certificated airports.

The Board did not attempt to write a safety report card on each of the airports it studied. The airports were chosen as a cross-section of the small, medium and large hubs throughout the country—Washington National and Dulles International in the District of Columbia and Virginia; J. F. Kennedy International and La-Guardia in New York; Los Angeles International, San Diego-Lindberg and Burbank-Glendale-Pasadena

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in California; Houston Intercontinental and Houston-Hobby in Texas; Chicago-O'Hare and Chicago-Midway in Illinois; Denver-Stapleton in Colorado; Boston-Logan in Massachusetts and Ft. Lauderdale-Hollywood in Florida.

A team of aviation safety specialists visited all 14 airports to gather data and interview airport personnel on broad issues of airport safety. The Board's analysis of the voluminous record found, in a report issued in April 1984, that there had been "a measurable improvement in airport safety" under FAA's airport certification program. The Board attributed this to safer aircraft, better pilot training, additional navigation aids, and improved weather service and air traffic control, as well as to safety regulation of the airports themselves.

With its report, the Safety Board issued 21 recommendations to FAA for safety improvements at regulated airports. Among other goals, the Board sought:

—Careful safety assessments before any crash-fire-rescue (CFR) requirements are eased at any of the smaller airports served by airlines.

—New regulation of the safety of airport fuel farms and refueling facilities, including certification of personnel, new design and construction guidelines, and detailed inspection procedures.

—Rewriting parts of FAA's airports certification handbook, and more frequent reassignment of its airport safety inspectors to promote regulatory uniformity wherever possible.

The Board said suggested reductions in crash-fire-rescue requirements at Class A and B airports—the smaller fields at which air carriers operate—could result in "little or no" CFR protection there, even for airliners such as the Boeing 767 and 757. Any proposed rulemaking should be accompanied by lists of affected airports, types and schedules of airliners serving them, "and a description of the effect . . . on firefighting posture," the Board said.

Although FAA had the legal authority to regulate training and proficiency of refueling personnel at airports, it was not doing so, the Board reported. Its investigators also found no standardized program for training of FAA inspectors on fuel dispensing and storage. Construction on airports and in surrounding areas was found to have eliminated or reduced original separations between fuel farms and commercial or residential developments.

At year's end, further information on FAA action was needed before the Board could decide whether or not its recommendation goals would be met. FAA's acknowledgment of the recommendation for careful study of any easing of CFR requirements reported the agency's concurrence in the Board's recommendation, however. In its initial response to fueling recommendations, FAA said any licensing of fueling personnel would cover all airports, not just certificated fields, and would not involve airport operators in any licensing process.

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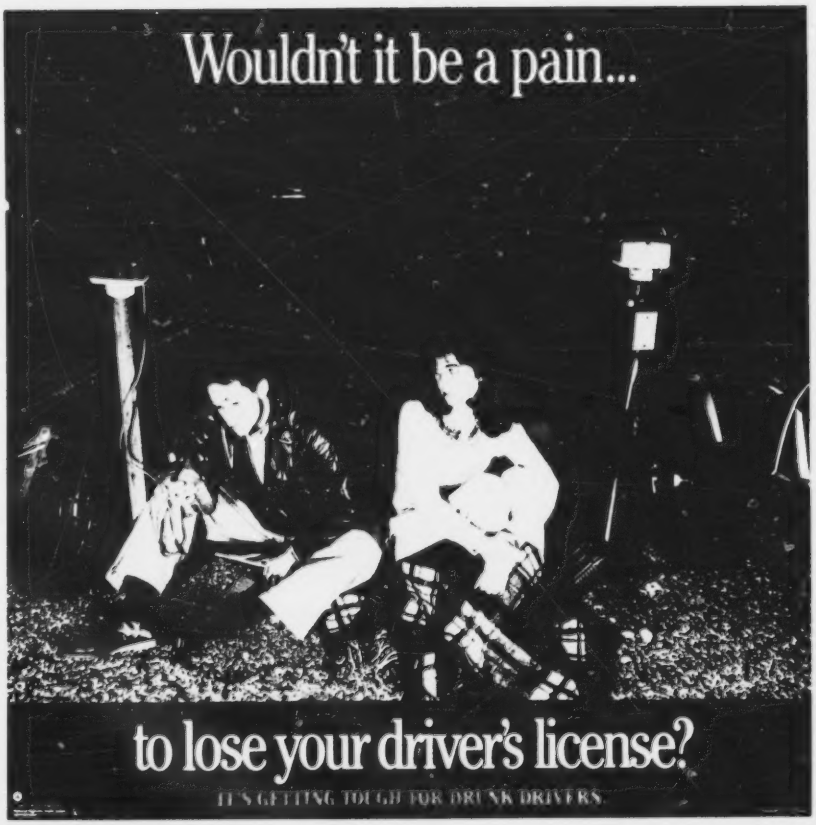
Highway Safety

Drunk Driving

With more than 90 percent of all U.S. transportation fatalities occurring on the nation's highways, and more than half of fatal highway crashes involving alcohol, drinking drivers clearly have the greatest single impact on transportation safety.

In 1982, the Board began a program to reduce the particularly tragic loss of life caused by young drunk drivers, and to increase citizen participation in enforcement of drunk driving laws already on the books.

In July 1982, the Safety Board recommended that all state drinking age minimums be set at 21. The 26th Amendment to the Constitution, extending the Federal franchise to citizens between 18 and 21 years of age, had brought with it reductions in drinking age minimums in 29 states. The impact on young drivers quickly became apparent. With ages 18 to 21 already over-represented in accident statistics, measurably more young people were being involved—and victimized—in drunk driving crashes. A reverse trend toward higher drinking age minimums began in the mid-70s, but at the time of the Board's action in 1982, there still were 35 states and the District of Columbia with minimums below 21. Following up on its recommendation to the governors, the Board and its staff



presented testimony before numerous state legislative committees considering a growing number of proposals to raise drinking ages. The Board also brought the issue to the attention of the Presidential Commission on Drunk Driving.

By 1984, eight states had raised their minimum age to 21, and there was support for such legislation in many others. Then, in July 1984, President Reagan signed legislation into law that mandates withholding a portion of a state's highway construction funds if it does not establish an age 21 minimum within two years.

Significantly more states also became involved in 1984 in the push for greater citizen participation in effective enforcement of drunk driving laws. The Safety Board recommended in September 1982 that all states establish

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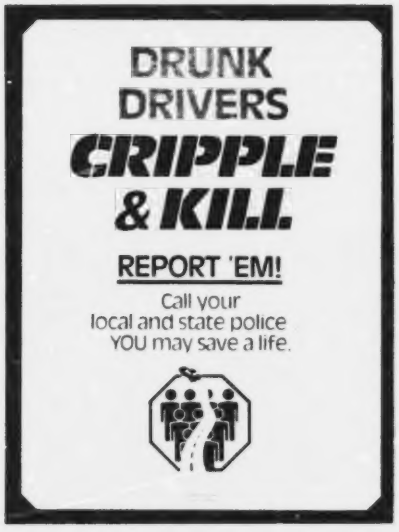

drunk driver programs such as REDDI—Report Every Drunk Driver Immediately.

These programs involve publicity campaigns to teach citizens to report drivers exhibiting tell-tale drunk driving characteristics such as weaving, braking erratically, and crossing centerlines, so their vehicles might be observed by police. Results of such programs, in number of arrests resulting from citizen telephone and CB radio calls, have been impressive.

By 1984, 27 additional states had established such citizen report programs. As of June 22, in the 32 states keeping such records, 63,055 citizen reports of drunk drivers had been received. Nearly 16,000 motorists were brought under police surveillance, leading to 10,120 driving-while-intoxicated (DWI) arrests.

Drunk Driving Prevention

The Safety Board's efforts in 1984 to curb drunk driving not only were expanded significantly, but turned more toward prevention and general deterrence. Past safety efforts have shown that general deterrence of drunk driving can be achieved only if punishment for drunk driving, is *sure, swift* and *severe*. But statistically, the average American motorist can drive drunk for 5,000 miles before being arrested even once. Rates of arrest vary with the aggressiveness of local enforcement, and the probability of arrest thus ranges from 1 in 200 to 1 in 2,000. And even in the unlikely event of a DWI arrest, the offender stands an excellent chance of avoiding meaningful punishment through plea bargaining, court backlogs, and referral to well-intended but ineffective alcohol "training programs."

With general deterrence as its goal, the Safety Board in April 1984 recommended that all states adopt the twin strategies of sobriety checkpoints and administrative license revocations as integral parts of their drunk driver control programs.

The Board found that police agencies in some 21 states were using or had used sobriety checkpoints—roadblocks at carefully selected points and times. Advance publicity on the program and its objectives, if not on the exact time and place of the checkpoints, serves notice on all local motorists that they may be stopped and checked for signs of alcohol impairment. Drivers also learn that they cannot avoid detection of their drinking by driving "cautiously."

The checkpoints were not proposed as a substitute for normal police patrolling, but as a new element of local DWI enforcement programs. By their nature, the checkpoints serve to reduce sharply driver assumptions that they can drive after drinking with little fear of being caught—they meet the general deterrence criteria for "sure" detection.

Once the drunk driver has been arrested for drunk driving, the need then is for sanctions that are swift, and, for most, severe.

Motor vehicle administrators historically have had ample statutory authority to revoke or suspend the licenses of drivers who pose a threat to the public, but traditionally have been conservative in the use of that power. As a result, known drunk drivers are being allowed to continue to operate their vehicles, sometimes for as long as a year, pending lengthy court proceedings. And in many cases, they drive drunk again, under a valid license, and cause more deaths and injuries.

The administrative license revocation is both swift and severe. It also is simple. The police officer,

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after obtaining a blood or breath alcohol concentration above the state limit (in most cases 0.10 percent), takes the driver's license on the spot. The offender receives a temporary driver permit, usually good for seven to 30 days. The driver may request an administrative hearing on the officer's revocation action, but when the temporary permit expires, that operator no longer may drive legally. The license revocation typically extends for 90 days, independent of any court proceedings on a DWI charge.

Although it is difficult to isolate the lifesaving effects of checkpoints and administrative license action, the Board found an indicator in the State of Delaware—one of the few states which tests nearly all fatally-injured drivers for alcohol, and one that uses both checkpoints and administrative revocation. The number of both surviving and fatally-injured drivers with blood levels above .05 percent was down by nearly 20 percent in Delaware from 1982 to 1983—the first year checkpoints and administrative suspension were in effect. Longer-term statistical measurement of such results is needed, but the Delaware result was impressive.

Repeat Offenders

The Safety Board's investigative expertise was applied to one of drunk driving's more intractable problems—the repeat offender. The Board investigated or reviewed 51 accidents involved 56 drunk drivers. Forty-five of the accidents were fatal; there were 73 fatalities. Thirty-seven of the accidents involved known repeat offenders.

The 56 drunk drivers had accumulated 164 arrests for offenses involving alcohol, including 131 for DWI. They had at least 124 convictions for alcohol-related offenses, including at least 93 DWIs.

Board investigators reviewed driver histories. They interviewed 40 convicted drunk drivers and many accident witnesses, police officers, attorneys and judges. They sought moments in the drivers' past histories when their outlook and behavior toward driving after drinking could have been changed. They also searched for loopholes in the judicial system that permit repeat offenders, and for practical closures for those loopholes.

The Safety Board's recommendations show its findings. In October 1984, it urged the states to . . .

—Encourage the use of preliminary breath test devices and recommended sobriety check techniques by all law enforcement agencies.
—Propose legislation, if needed, to facilitate gathering of DWI evidence based on blood tests.
—Seek to prevent reduction of alcohol charges to non-alcohol charges, and require that driver records in all cases show the original alcohol charge.
—Support training in alcohol problems for all judges hearing DWI cases.
—Improve record-keeping on alcohol-related offenses of both juveniles and adults.
—Require alcohol problem evaluations in all alcohol offense cases, and make findings available to judges ruling on them.
—Improve alcohol problem treatment programs designed specifically for juveniles.

Seat Belt Effectiveness

"Seat Belts Save Lives."

Few quarrel with that proposition, but the Safety Board is casting a quizzical eye on the effectiveness of the belt systems available to American motorists. Do they work as designed? Is their design correct? Are there belts that do not, in fact, protect their wearers adequately?

Federal and state agencies routinely investigate fatal and serious-injury highway accidents, but have not developed a sufficiently reliable body of data on the use of seat belts and their effectiveness when they have been used. In July 1984, the Safety Board began a study of the performance of occupant restraints in survivable crashes. Highway safety specialists in eight Board field offices began documenting crash dynamics, sources of injury, and the use and effectiveness of lap and shoulder belts in crashes that were survivable.

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By the end of 1984, 30 investigations had been completed and 50 more were under way. Most of the accidents were moderate to low-speed impacts that involved vehicle front ends, and caused sufficient damage to require towing. In some cases, a mix of belted and unbelted occupants of the same vehicle promised direct comparisons.

The investigative phase of the project was to be completed by the fall of 1985, with analysis and issuance of a report possible by the end of the year.

Child Safety Seats

The enormity of the overall highway safety problem in the United States sometimes overshadows the success that is achieved in addressing one of its individual elements. This has been the case with progress in saving the lives of children and infants in motor vehicle accidents on U.S. highways.

As recently as 1980 through 1984, more than 3,100 child passengers under age five were killed in motor vehicle accidents. More than a quarter of a million were injured. This toll—higher than that of all of the common childhood diseases combined—included children who never again would walk, or were left with permanent brain damage.

The loss was all the more tragic because it was largely needless: Studies indicate that up to 90 percent of the fatalities and the vast majority of serious injuries could be prevented by the proper use of child safety seats. A special Safety Board investigation that was launched in 1982 dramatically demonstrated that children in safety seats were unharmed in accidents that killed or severely injured their parents. The investigation encompassed 53 accidents that were scrutinized by highway safety specialists in the Board's field offices. Their detailed findings similarly showed dramatic differences in the injuries to infants and children who did and did not have safety seat protection.

After enactment of a pioneering child safety seat law in Tennessee in 1977, other states began to pass similar laws. By late 1982, such laws had been enacted in 19 states. But most of the nation's young remained unprotected. On December 7, 1982, the Safety Board recommended legislative action in the remaining 31 states and the District of Columbia, and urged as well the adoption of comprehensive, statewide child passenger safety programs to enhance the effectiveness of the new laws.

By the end of 1984, every state in the country save Wyoming had a child passenger protection statute of some kind. The Board had been instrumental in the

Thirty-mile-an-hour impact with a brick building caused this damage, injured four unrestrained adults seriously, but left a three-month-old baby in a child safety seat with one small bruise. *(Photo by Tracy Farley, Shawnee (OK) News-Star)*

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adoption of many of the new statutes, providing testimony, accident case histories, and amplifying details of the 1982-84 study. Texas, which became the 49th state to act, was an example of this.

Actual use of child safety seats has risen substantially. In 1981-82, only 22 percent of automobile passengers under five years were restrained, according to a National Highway Traffic Safety Administration (NHTSA) study. By the end of 1983, a 19-city survey showed the same proportion to be 40 percent. By the last quarter of 1984, according to NHTSA's latest survey, 49.3 percent of young children in automobiles were restrained.

Ironically, the Safety Board's January 1984 report that so dramatically showed the need for child safety seats also demonstrated that those that are in place in vehicles on U.S. highways often are being misused. Only six of 34 seats in use in accidents the Board investigated were being used correctly. Although it found that even misused seats "may still provide some protection," the Board concluded that misuse of the seats "appears to be a significant and widespread problem."

Misuse or failure to use the tether strap—needed to secure the top of some seats to a rear seat belt or some other vehicle anchorage point—was the most common error found by Board investigators.

The Board also (1) recommended that manufacturers of the safety seats review and improve the clarity of instructions for the use of their seats, and apply permanent labels identifying correct belt and harness routing points and seat positions; and (2) urged states to conduct statewide programs specifically aimed at misuse of safety seats.

The remainder of Calendar Year 1984 brought "acceptable action" classification for a number of the Board's safety seat recommendations as reports arrived from state capitals. Some state laws remained less than optimum, but the goal of required child safety seat protection—nationwide—clearly was being achieved. Proper use of the protection that now is required thus has become a primary Board objective.

To find the most effective means to reduce misuse of child safety seats, the Board at year's end was planning a one-day symposium in Washington at which government and industry specialists could compare notes and map strategy. The Board was considering additional special investigations, this time seeking to find means by which state and local agencies and organizations could improve safety seat use rates and reduce misuse rates.

Bridge Safety

Few highway accidents hold the terror for its victims or the impact on safety authorities as a bridge collapse that sends unsuspecting motorists plunging through a void to their deaths below.

The Safety Board in June 1984 issued its report on such a tragedy—the collapse of a 100-foot section of the Mianus River Bridge at Greenwich, Connecticut, on June 28, 1983. Three persons were killed and three others injured when all three lanes of eastbound Interstate 95 disappeared in front of them and their vehicles fell 70 feet into the river. Fortunately, the accident occurred at 1:30 a.m. when traffic was light.

The Board's 108-page report held that the State of Connecticut's bridge inspection and maintenance programs, culminating in its inspectors' failure to detect displacement in the pin-and-hanger assemblies that connected suspended spans to the fixed structure of the bridge, had caused the collapse of a suspended span. The movement affecting the assemblies was the result of a corrosion buildup between the bridge girders and the 6.5-foot-long hangars as washers rusted, the Board found. The buildup generated a lateral force that could have reached 350,000 pounds—enough to move the hangars off the pins at the southeast corner of the bridge and begin the collapse sequence, the Board reported.

The bridge had been inspected nine months before the accident,

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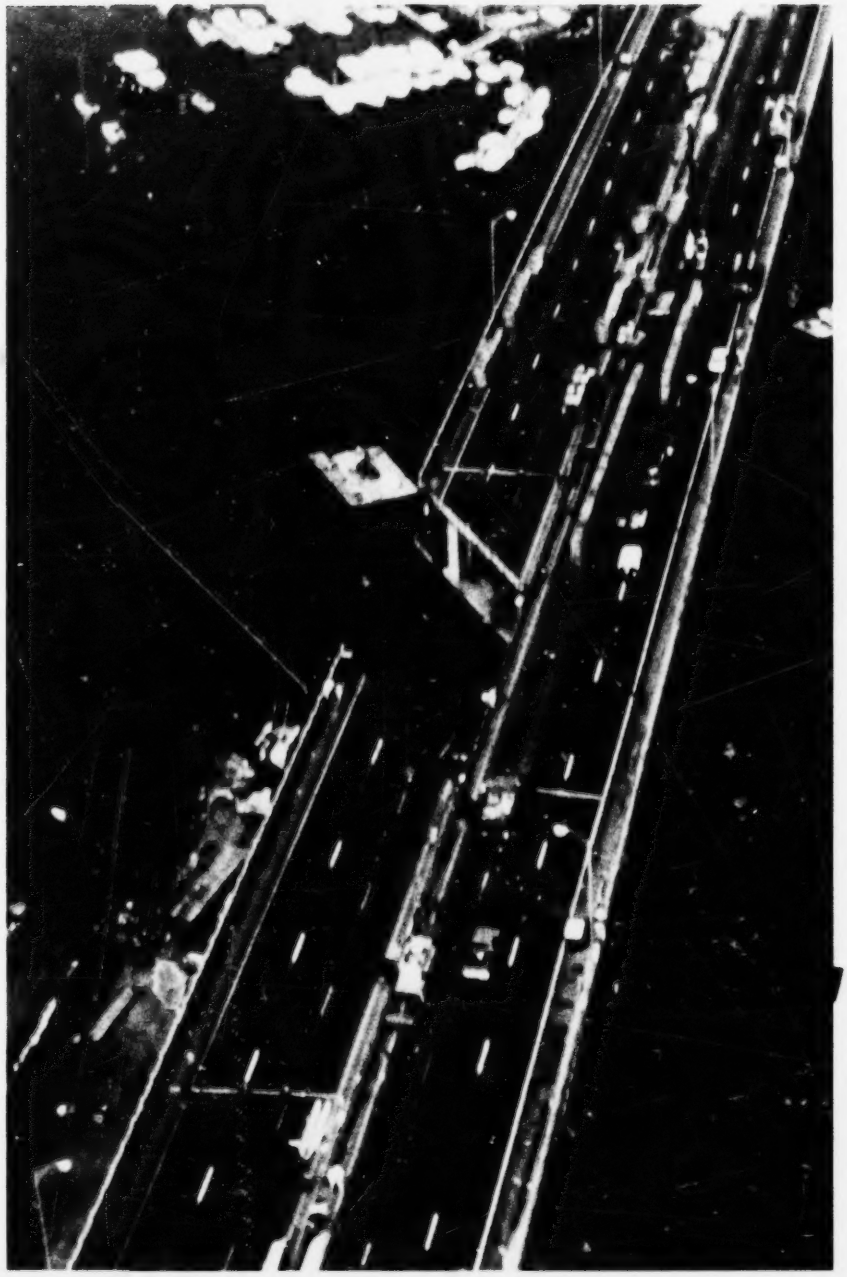
Safety Board report in 1984 held that faulty state inspection caused the June 28, 1983 collapse of this 100-foot section of the Mianus River Bridge at Greenwich, Conn., killing three.



but the Board found that the inspectors had not been given specific instructions for inspection of the pin and hangar assemblies, and the inspection itself was "cursory." The State's Department of Transportation never considered dismantling the hangars for inspection, and apparently was unaware of advisories that such a procedure might be necessary, the Board concluded.

In its report, the Safety Board made a series of 28 bridge safety recommendations to the Connecticut and U.S. Departments of Transportation, the Federal Highway Administration and industry organizations. Among them was a recommendation that the U.S. Department of Transportation's Inspector General review the Federal Highway Administration's bridge inspection audit program to identify any shortcomings and strengthen its evaluations of State compliance with national bridge inspection standards. In November 1984, the U.S. DOT reported that its inspector general was expanding three planned audits of the Federal Highway Administration's bridge programs to include its surveillance of state bridge inspection.

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Highway-Rail Grade Crossings

The Safety Board in 1984 intensified its investigation of highway-rail grade crossing accidents.

Under "Operation Lifesaver," one of the nation's best examples of government and industry cooperation to achieve tangible safety progress, far fewer Americans now die at grade crossings. As recently as 1978, this toll was more than 1,000 persons a year. By 1983, it had been reduced to 404.

A July 1976 grade crossing crash at Des Moines, Iowa had illustrated the needlessness of many losses in such accidents. Safety Board investigators found that at least two motorists drove through the crossing even though a freight train was approaching and warning red lights were flashing. A third motorist did not make it across, and she and her four children were killed. Investigators

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found that every motorist that had an opportunity to do so had slowed for the crossing and looked to see if they could beat the train across.

The Board recommended in its accident report that the National Safety Council become the national coordinator of Operation Lifesaver. The Board had found that such programs in at least four states had achieved grade crossing fatality reductions of up to 63 percent.

The Board's recommendation was fulfilled, and Operation Lifesaver spread across the nation. By 1983, it was a reality in more than 40 states, and there was little question that it was the major factor in the 60 percent drop in grade crossing fatalities between 1978 and 1983.

The first nine months of Calendar Year 1984, however, brought a distinct reversal of the five-year decline in both fatalities and injuries. According to preliminary accident statistics, there were 467 fatalities at grade crossings in January-September 1984, up 15.6 percent over the same months of 1983, and 2,187 injuries, an increase of 17.5 percent. There also were several serious accidents involving Amtrak passenger trains.

The Safety Board began a review of 17 grade crossing accidents it had investigated in 1983 and 1984, seven of them involving Amtrak trains, and found some significant safety issues: Long, low-slung truck trailers were becoming lodged on crossings. "Booby-trap" crossings, where obstructions to view were affecting safety, still were causing accidents. School buses and heavy trucks—some of them carrying hazardous materials—were not being routed over improved, guarded crossings. Some train crews were exceeding speed limits in their approaches to crossings.

In addition to its review of 1983-84 accidents, the Board planned 50 or more special investigations, beginning in January 1985, of both fatal and non-fatal grade crossing accidents involving Amtrak trains. Railroad safety specialists were to identify accident issues, then concentrate their efforts on those that had been identified by the review, while remaining alert to any new problems that might arise. Findings and recommendations from the review and special investigation effort were scheduled to be completed by the end of 1985.

Warning lights and gates couldn't prevent this grade-crossing accident in September 1984 at Ft. Pierce, Fla. because the bus stalled on the tracks before they were activated. Two died in the accident. *(Photo by Juan Dale Brown, Ft. Pierce News Tribune)*

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Railroad Safety

Alcohol and Drugs

Calendar year 1984, as it drew to a close, gave every indication that what had become a two-and-one-half-year Safety Board campaign for federal action to outlaw alcohol and drugs on the nation's railroads was very close to its goal. In fact, it produced all but the needed final rulemaking by the Federal Railroad Administration.

The Board's effort was launched in June 1982. In a speech to railroad safety officials, Chairman Jim Burnett pledged the Board to "an intense and unrelenting campaign against alcohol abuse in railroading." Citing a Federal Railroad Administration-funded study that showed 19 percent of 234,000 workers surveyed at seven major railroads to be repetitive excessive drinkers, Chairman Burnett called on FRA at least to prohibit crewmember drinking while they are on the job or just before they report for duty.

FRA's initial position was that railroading is an industry in which close supervision of operating employees is "often impossible," and that cooperative efforts of railroad management and labor toward education and rehabilitation were achieving "good . . . momentum." In September 1982, however, a hazardous materials derailment in Livingston, Louisiana forced the evacuation of 3,000 residents for 15 days or more, and caused damage estimated at $12 million. The Safety Board investigation showed that causal factors included the misapplication of locomotive brakes by an unauthorized rider on the Illinois Central Gulf freight train—a clerk who was "substituting" for the engineer at the controls. The engineer had drunk at least 14 ounces of 86-proof liquor during the 5½ hours preceding the derailment.

Even before issuing its formal report of cause of the Livingston accident, the Safety Board in March 1983 transmitted safety recommendations to FRA urging that it:

—Apply to railroad crewmembers the same type of Federal "bottle-to-throttle" regulation long used by the Federal Aviation Administration to prohibit alcohol for a specified period before flight.

—Require toxicological testing of surviving train crewmembers for alcohol or drugs after all serious accidents.

—Improve railroads' reporting of all accidents and incidents involving use of alcohol or drugs.

The Board based its recommendations on 18 accidents over a ten-year period that had cost the lives of 25 railroad employees, seriously injured ten others, and caused property damage totaling some $25 million. And there were to be more. The Board in 1983 found as a contributing factor in a fatal Missouri Pacific freight train collision in Arkansas "the action of the alcohol-impaired engineer in relinquishing control of the train to the head brakeman who was not a qualified engineer."

On July 5, 1983, FRA responded to the Safety Board recommendations by publishing an advance notice of proposed rulemaking on alcohol and drug abuse, and seeking public comments. FRA conducted four hearings in Washington, Atlanta, Kansas City and Sacramento. Chairman Jim Burnett, Vice Chairman Patricia A. Goldman and Member G. H. Patrick Bursley made clear with their testimony the Board's belief that the rulemaking was long overdue. As Chairman Burnett testified: "The Federal government has a legal and moral responsibility not only to protect passengers and crewmembers aboard trains, but also countless thousands of Americans who every day of the year are potential victims of a . . . major hazardous materials accident in their community."

Still another freight train wreck, in September 1983 at Sullivan, Indiana, was found to involve alcohol. The engineer of the overtaking train in a Seaboard system rear-end collision had a blood-alcohol level of 0.27 percent about five hours after the two-fatality wreck. He had been drinking in three bars for 12 hours before reporting for work, and had turned his locomotive over to an unqualified head brakeman.

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A 1984 freight train collision at Wiggins, Col.—one of two such wrecks within nine days on the Burlington-Northern. The accidents killed seven and injured four. A common element: Alcohol.

The succession of freight train wrecks involving alcohol or drug-affected train crewmen reached an ominous peak early in 1984. On one railroad, the Burlington-Northern, there were two collisions within nine days that killed seven crewmembers, injured four and caused damage of more than $5.2 million.

There were many other similarities in the two accidents—at Wiggins, Colorado on April 13 and at Newcastle, Wyoming on April 22. Both occurred on single-track mainlines where trains operated according to wayside automatic block signals of a centralized control system. "Passing" tracks, reached through remotely-controlled switches, were used to separate trains moving in opposite directions.

Post-accident testing showed that the control system and the signals and switches had functioned properly, but crewmembers of one of the two trains in each accident had failed to comply with the signals displayed. Both of the crews that did not heed signals were operating out of away-from-home terminals, and both engineers had failed to get adequate rest while off duty. The accidents occurred between 3:30 and 5:00 a.m.

At both locations, the Board found, crews could not get accurate advance information on when they probably would be called to work. There was no night-time supervision at either of the crew-change locations.

At Wiggins, the engineer and fireman of the freight train that failed to pull off the main line, colliding head-on with another, had never gone to bed between runs. Instead, they spent up to six off-duty hours drinking beer in taverns. At Newcastle, the engineer of the overtaking freight in a rear-end collision admitted he had used marijuana between runs, and had dozed off at the controls as his train was passing the critical signals directing him to leave the main line. Investigation showed that six of the 12 crewmembers involved at Newcastle were marijuana users.

In June 1984, Chairman Jim Burnett presided at a public hearing in Denver on the two Burlington-Northern alcohol-and-drug accidents, and Vice Chairman Patricia A. Goldman took the Board's campaign to Capitol Hill in an appearance before the Surface Transportation Subcommittee of the Senate Committee on Commerce, Science and Transportation. "The threat of an alcohol or drug-impaired crew operating a train carrying hazardous materials is not simply some headline-grabbing scenario," she said. "Rather it is very much . . . a real world possibility."

Six days after Vice Chairman Goldman's testimony, the FRA issued its Notice of Proposed Rulemaking on "Control of Alcohol and Drug Abuse in Railroad Operations." The proposed rule would:

—Prohibit the use of alcohol and drugs in railroad operations.
—Require toxicological testing of employees after major accidents and incidents.
—Require pre-employment drug screening of applicants for operating and certain other positions.
—Authorize railroads to require employees to cooperate in drug tests under certain circumstances.

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—Require railroad policies encouraging identification of employees with alcohol or drug problems.
—Improve the railroad accident and incident reporting system.

The Safety Board supported the proposed rulemaking as consistent with its recommendations, but urged certain improvements. It said FRA should (1) state explicitly that the regulation is a minimum for railroads' efforts to curb alcohol and drug abuse; (2) insure a standardized drug testing system; (3) provide for testing of all employees directly involved in an accident, whether or not they are covered by the Hours-of-Service Act; and (4) avoid giving any impression that an employee with a blood-alcohol content of up to .04 percent is not impaired.

The rulemaking comment period closed on August 15, and FRA promised a regulation that would be effective "on or about January 1, 1985." The New Year came and went, but the agency's action still remained "imminent."

Passenger Train Safety

Amtrak learned in 1984 what U.S. airlines had learned over many years: Catastrophic accidents do not occur at neat, evenly-spaced intervals. In a 23-day span in July, Amtrak trains were involved in a five-fatality derailment, a head-on collision in its own Northeast Corridor, and three fatal grade crossing accidents.

The derailment raised anew a serious safety issue that the Board had addressed after a June 1982 accident in Emerson, Iowa. In that derailment, Amtrak's famous "San Francisco Zephyr" had sped at 74 miles an hour into floodwaters that had washed out Burlington Northern's mainline track. One passenger died, 27 were injured, and damage totaled $3.4 million.

The Safety Board held that neither Amtrak nor Burlington Northern had adequate means of collecting and evaluating weather information so passenger trains would not be dispatched at high speeds into hazardous conditions—at Emerson, flooding so severe that local residents were being evacuated by boat. The Board recommended that Amtrak use professionally-gathered knowledge of severe weather in its nationwide operations, and require all of its contracting railroads to do the same in their territories.

Amtrak responded to both recommendations with a promise to work on the problem at their national system center. In April, the Board asked Amtrak for a direct response to the recommendation that weather information systems be required of all the contracting railroads.

On July 9, 1984, Amtrak's "Montrealer" derailed on a washed-out section of track in northern Vermont. Three passengers, the conductor and an Amtrak service employee were killed. Twenty-four passengers were hospitalized. Damage was estimated at $5 million.

A highly localized rainstorm had dropped some six inches of rain in a matter of hours before the accident. The railroad, Central of Vermont, had not received a National Weather Service flash flood warning for the county in which the track was washed out. If it had, it still could not have warned the crew of the Montrealer, or issued a slow order, because the Montrealer's train radio was inoperative. The Safety Board has recommended for years that operable radios be required on all passenger trains. Although Amtrak trains today do carry radios, such equipment still is not required by FRA.

In October 1984, Amtrak told the Board that (1) tone-alert weather radio receivers had been installed in towers and dispatching offices and at other points on Amtrak property; (2) a contract weather reporting service, covering all of Amtrak's system, had been installed at its Washington headquarters; and (3) all contract railroads had been contacted and a dozen had reported they had or were installing systems to monitor weather in their territories. Burlington Northern and Central of Vermont were among them; they had acted voluntarily after the 1982 and 1984 accidents.

The head-on collision occurred on the 23rd Avenue overpass in

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A track washout from heavy rain caused this July 9, 1984 derailment of Amtrak's "Montrealer" in northern Vermont. Five persons were killed and 24 were hospitalized.

Queens, New York City. One passenger was killed, both engineers were hospitalized, and 125 other passengers were injured. Property damage was estimated at $3.2 million.

A northbound train was to have stopped and waited at the "home" signal on the No. 2 track for the arrival of a southbound train. But the northbound train passed the signal and the two trains collided slightly over a mile north of it.

Track No. 1 was closed for maintenance, and No. 2 was being used for trains operating both north and south. The southbound train was given clearance for the No. 2 track by train order. The tower operator, who had only 12 days of experience, was instructed to apply a panel blocking device at his station that would preclude his displaying a proceed signal to allow northbound trains on No. 2 track beyond the home signal. He told investigators he did not give a proceed signal to the northbound Amtrak train. He also told them he was confused about who had jurisdictional control of various track sections for which he was responsible.

The northbound train's engineer suffers from retrograde amnesia, and recalls none of the events prior to the accident. The question of whether the signal was set against the northbound train, prohibiting it from continuing north, thus may be unanswerable.

One of the three grade crossing accidents, on July 11 at McBee, S.C., raised the familiar issue of hazardous materials vehicles posing the threat of catastrophe when they are hit by trains—particularly passenger trains—on grade crossings. At McBee, Amtrak's Silver Star struck a fuel truck on a passive-protection crossing—one not equipped with flashing lights or gates—killing the truck driver and the engineer and seriously injuring the fireman. The regular, active-protection crossing with its automatic gates, lights and bells, located only a few hundred yards away, had been closed while the Seaboard Railroad was working on it. Highway traffic was being detoured by local authorities to the nearby passive crossing. The nearest active crossing was several miles away. A Seaboard slow order that was to slow trains to 20 mph because of the crossing work was not yet in effect.

In a 1981 special study on hazardous materials accidents at grade crossings, the Board found

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that such accidents take an annual toll of seven lives, 41 injuries and nearly $1.6 million in property damage. The Board recommended that hazardous materials trucks be routed, whenever possible, to railroad overpasses or to active-protection crossings—particularly near fuel terminals. The Federal Highway Administration has reported it is studying the issue, and that a pilot advisory group has been formed in Virginia to help find solutions to the problem.

Rail Rapid Transit

In the Safety Board's 18-year history, there have been a few safety issues that have prompted the Board to undertake industry-wide investigations as the basis for safety recommendations. One of these, because of the large potential for disaster, is rail rapid transit safety—particularly the specter of a rush-hour train, with a thousand or more passengers, caught in a subway fire.

A harrowing January 1979 fire in San Francisco's Transbay Tube well illustrated the problem. When a fire involving two of its cars disabled a seven-car Bay Area Rapid Transit (BART) train in the tunnel during rush hour, other trains, with many passengers aboard, were sent into the tunnel to help in the evacuation of the stranded train's passengers. Had the fire spread farther, or had propulsion power been lost before the "rescue" trains could move out of the tunnel, many lives could have been lost. At best, hundreds of lives were jeopardized.

The Safety Board issued 14 recommendations for improved fire safety in rail rapid transit, including better information in subway cars for passengers faced with making an emergency evacuation. The Board believes that BART's response, which included new subway car placards in two languages, should be a model for the industry.

In July 1980, the Safety Board convened a public hearing that explored major rail rapid transit safety problems. Testimony of national fire safety officials and local fire chiefs during the two-day hearing underscored fire hazards and the problem of evacuating subway cars in tunnels. Early in 1981, the Board made 31 safety recommendations to nine agencies and organizations. The key recommendation sought federal regulation of rail rapid transit safety. It did not result in action at the federal level, and the Board therefor turned toward state government for the safety oversight it believes to be pivotal in advancing mass transit safety.

Later in 1981, the Board issued a major report on its special investigation of eight New York City subway train fires in a 13-month period. Safety regulation again was the Board's principal objective, but this time it urged the New York State Legislature to

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authorize a new or existing independent agency to regulate safety of New York City Transit Authority (NYCTA) operations. Initial legislation creating such an agency was vetoed. The Safety Board reiterated its recommendation in May 1982 in a later report on an NYCTA accident, and a New York State Public Transportation Safety Board finally was created in 1983 and began operation in May 1984.

Despite this progress, fire safety and evacuation problems continued to plague the aged New York subway system. On March 17, 1984, an NYCTA train derailed in a tunnel under the East River. Although the accident was near the Brooklyn Bridge Station, it took more than three hours to evacuate the 1,500 people aboard the train. The Safety Board conducted a three-day public hearing, chaired by Safety Board Member G. H. Patrick Bursley, focusing on the evacuation and on NYCTA inspection of track that is under repair, as was the track where the derailment occurred.

In October 1984, according to a Safety Board check of NYCTA system records, there were 335 track and structure fires, eight electrical fires, and 226 car equipment fires. The majority were trash fires, but the New York City Fire Department responded to 48 subway fires during the month.

To develop a precise perspective on the NYCTA fire safety problem, the Board in December 1984 applied its "go-team" techniques by dispatching a team for an unprecedented, week-long investigation of fires, as they were reported, in the city's subways. "Working groups" were organized in five areas—mechanical, engineering, operations, emergency response and fire incident data. A dozen investigators from the Board's staff investigated and documented 133 of the 173 fire and smoke incidents that occurred on the system between December 10 and December 17.

At the conclusion of the investigation, Chairman Jim Burnett, who headed the special investigation team, said he was convinced that the Safety Board's report in 1985 would "document to a startling degree the severity of the situation in which the NYCTA and its riders find themselves." He said Board investigators were "favorably impressed with the scope and the thoroughness" of the maintenance training program NYCTA was to inaugurate in January 1985. But he expressed concern that it would take seven years for all maintenance personnel then employed by NYCTA to be trained.

Chairman Burnett also reported his concern that investigators had found numerous fire extinguishers that were empty or missing. There was at least one location where street construction had blocked a tunnel escape hatch, but there was no indication of this at the foot of the ladder in the subway tunnel.

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Marine Safety

Off-Shore Oil Drilling

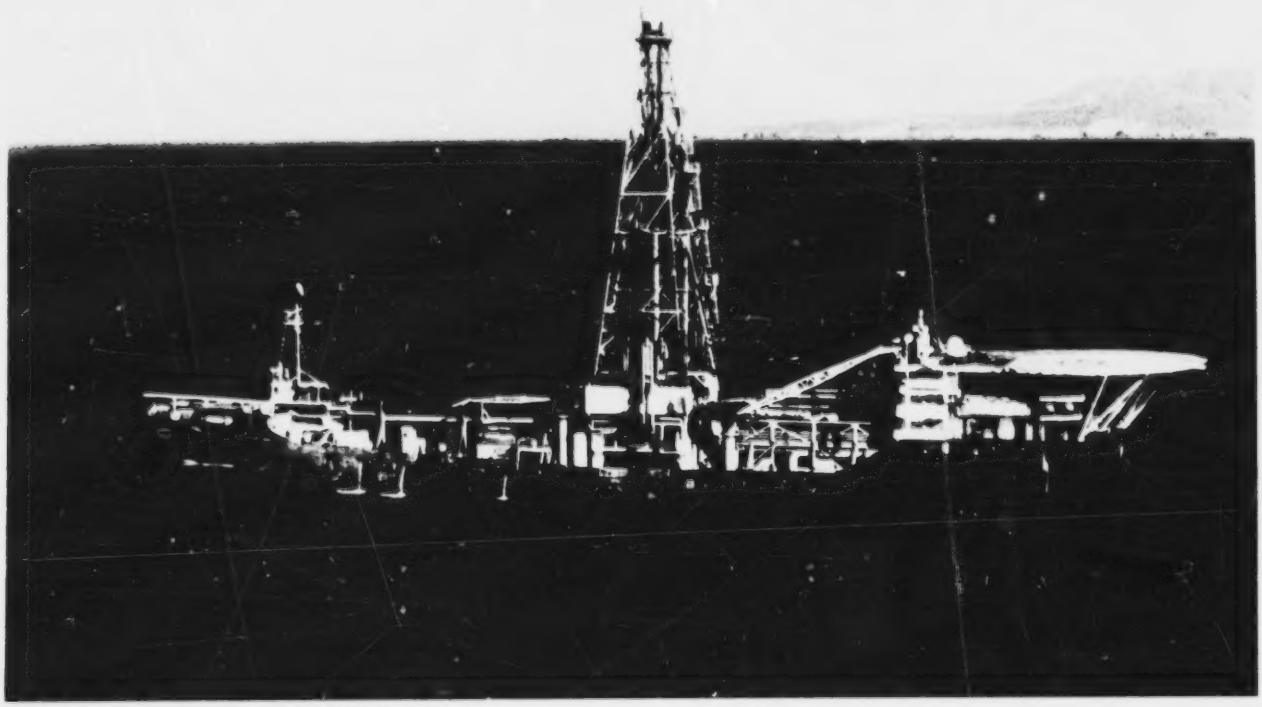
"All hands were lost."

Tragedies that leave no survivors hardly are new to those who go to sea, but the impact of such sinkings today probably is greater because of the sophisticated twentieth century technology that is often employed to prevent them.

In 1982, a U.S. mobile off-shore drilling rig capsized and sank in a North Atlantic storm off Newfoundland with the loss of all 84 crewmembers. The Board found that seawater had entered through a shattered porthole of the "Ocean Ranger" and splashed onto a ballast control console. This caused an electrical malfunction that disabled the automated system for control of ballasting. The crew then was unable to operate the ballasting system manually.

In November 1984, the Safety Board issued its report on the capsizing and sinking of the 400-foot oil drilling ship Glomar Java Sea in a South China Sea typhoon on October 25, 1983. This time, the loss was 81 persons—again, all hands on board.

The wreck of the U.S. drilling ship was found, upside down, in about 315 feet of water. Diving and underwater filming disclosed two structural failures. One was



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in the main deck plating above the starboard "wing tanks" that were found to have flooded. The other was a massive failure of the starboard side, from deck to keel.

The Board concluded that structural failure had caused the accident, and that the crew's decision to continue to use all nine of its anchors had contributed to that failure. The origin of the structural failure could not be pin-pointed; nor could the Board determine which failure caused the wing-tank flooding. But because post-accident structural calculations showed only "moderate stress levels" were encountered by the ship before it sank, "there may be a structural design problem that was not detected" by the American Bureau of Shipping in its original certification of the Glomar Java Sea and its five sisterships, the Safety Board said.

The Safety Board thus recommended that the design of the six drilling ships be reviewed by the Coast Guard and the American Bureau of Shipping. The Board also reiterated three recommendations it had made in reporting on the Ocean Ranger accident. These sought (1) new regulations covering personnel qualifications and manning standards for mobile offshore drilling rigs and vessels; (2) licensing of masters and persons-in-charge of drilling operations, with license endorsements covering their expertise in drilling unit stability and lifesaving; and (3) a requirement that a standby vessel capable of foul-weather rescue of all personnel be assigned to all U.S. offshore drilling units at all times.

The oil-drilling ship Glomar Java Sea that capsized and sank in a South China Sea typhoon Oct. 25, 1983. Diving and underwater filming disclosed structural failure.

Navigation in Critical Areas

Two almost identical barge accidents in 13 months on the Mississippi River at St. Louis have underscored the Safety Board's efforts to improve navigation under bridges in flood-stage river waters, and to insure the capability of towboat masters to navigate such critical locations successfully.

On April 2, 1983, a four-barge tow laden with crude oil was being pushed down the Mississippi by the towboat "City of Greenville." The river was flowing at six to seven mph, and was only a foot below flood stage. It was a cloudy and occasionally rainy night, although visibility was eight miles. The 1,045-foot-long tow passed under the main spans of the Veterans Memorial and the Eads Bridges, but struck the east pier of the main span of the Poplar Street Bridge, rupturing at least one barge. Escaping oil ignited almost immediately, and three barges broke loose and floated downriver. The burning barges started several fires along a two-mile stretch of the river front. There were no fatalities or serious injuries, but total damage, including oil cleanup, was estimated at $9 million.

The Safety Board found that the towboat operator had encountered a cross-current at the Eads Bridge that he had not anticipated, although it was known to operators familiar with the area. He then mistakenly steered for lights on the Poplar Street Bridge that marked the east span, not the center span. By the time he discovered his mistake, he was forced to attempt to steer through the side span. The bridges are only eight-tenths of a mile apart.

Although he had been licensed on inland waterways since 1973, the towboat operator had made only two trips down the Mississippi at St. Louis, both in daylight, in more than 12 years, and neither trip had been made at times of high water or rapid current.

On April 26, 1984, history repeated itself at the Poplar Street Bridge. This time, a tow of 12 barges loaded with grain was being pushed downriver by the towboat "Erin Marie" just after midnight. The river was even higher, cresting at three feet above flood stage. The current was about eight mph. A relief operator also mistook the east span of the bridge for the center span. The regular operator was called to the bridge, but by the time he could

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take the helm it was too late to navigate the center span. The tow struck the bridge a glancing blow, and there was no fire, but the tow's loose barges triggered a chain reaction of barge breakaways along the waterfront until as many as 150 were adrift. Total damage to waterfront facilities, barges and cargo was estimated at $3 million.

The 1984 accident emphasized earlier recommendations the Board had made in its November 1983 report on the first accident. A key recommendation urged the Coast Guard to test future applicants for towboat operator licenses on their knowledge of the most critical portions of the nation's inland waterways.

In May 1984 the Coast Guard concurred in the intent of the licensing recommendation, and said it had begun a review of accident data to identify critical river areas. The subject also was to be considered by the Coast Guard's Towing Safety Advisory Committee.

Coastal Navigation

The Safety Board in 1984 also found room for safety improvement in coastal waters—the need for more sophisticated radar for precise navigation and for accurate tracking of other vessels, particularly in fog.

In August 1984, the Board adopted its report on the collision of the 137-foot passenger vessel "Yankee" and the 435-foot Liberian freighter "Harbel Tapper" in heavy fog on Rhode Island Sound July 2, 1983. Two of the ferry's 139 adult passengers were injured, although neither seriously. Both vessels were able to leave the accident scene under their own power.

The Board's investigation showed that until the collision was inevitable, neither vessel slowed as it approached the other in the fog—the ferry at 11.5 knots and the freighter at 8.5 knots. The master of the freighter ordered a left turn just before the collision, and the Board held that this had been the probable cause of the accident. Among contributing factors cited were the failure of the master of the freighter to evaluate the movements of the Yankee and another nearby vessel on his radar, and the Yankee master's over-reliance on his limited-capability radar.

The Board recommended that the Coast Guard require more sophisticated radar on certain passenger vessels plying extended routes in the nation's coastal waters. The Coast Guard had not responded to the recommendation at year's end.

Coast Guard Search and Rescue

Under the Safety Board's agreement with the Coast Guard, the Board conducts the investigation of marine accidents in which the Coast Guard might be involved in the cause. The Coast Guard assists in the investigation, just as does the Federal Aviation Administration in all major aviation cases.

Such was the case in the disappearance of the 80-foot fishing vessel "Amazing Grace" in the Atlantic Ocean in November 1984. With a crew of seven aboard, the vessel sailed from Hampton Roads, Va. on Nov. 7 for 17 days of scalloping off the mouth of Delaware Bay. It was 80 nautical miles off shore on Nov. 14 when its master, in the last known radio transmission from the Amazing Grace, reported to another scalloper of the same fleet that he was taking water in his fish hold.

The disappearance of the Amazing Grace was not reported to the Coast Guard until a day after its final radio transmission. The Coast Guard search for the vessel began on Nov. 15 and continued until Nov. 21. It was resumed on Nov. 22 after word reached the Coast Guard operations center in New York that an empty liferaft of the type known to have been aboard had been found in the search area. The renewed search continued until Nov. 30, but no further trace of the craft or its crew was found.

The Safety Board conducted a two-day public hearing in Portsmouth, Va. in December as part of its investigation. One of the areas examined was the misrouting of the report that the liferaft had

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been found, and the extent of the resulting delay in resumption of the search. Another was the Coast Guard's methods of plotting each day's search area.

It was tragically clear that an emergency position indicating radio beacon (EPIRB), had one been aboard the Amazing Grace, could well have taken searchers promptly to the scene of the sinking, and made rescue possible if any crewmen had survived. In its April 1980 report on a fishing vessel sinking off Point Judith, Rhode Island, the Safety Board had recommended that the Coast Guard seek authority to require EPIRBs on all documented U.S. fishing vessels. The Board urged the Coast Guard that, pending such authority, it use all available means to encourage their use voluntarily.

The Coast Guard in December 1980 agreed to seek legislative authority, but said it would not do so pending development of an international system employing low-orbiting satellites. The rationale was that in the four to five years needed to achieve statutory authority and to place final regulations in effect, the new satellite system would be going into service. The Coast Guard did instruct district commanders to urge voluntary installation of already available EPIRBs on all fishing vessels.

In February 1982, in response to a Safety Board follow-up letter on its EPIRB recommendation, the Coast Guard said again it would seek legislative authority to require satellite-compatible EPIRBs when an acceptable system was developed. By the end of 1984, with the target date for the international satellite-EPIRB system extending to 1990 and perhaps beyond, the Safety Board was considering recommending interim Coast Guard action to seek immediate legislative authority to require EPIRBs on all documented U.S. fishing vessels.

When the EPIRB issue does reach Congress, there will be new evidence of the cost effectiveness of devices that drastically shorten search times: The total value of the search and rescue effort of the Coast Guard and other federal agencies in the case of the Amazing Grace was $12 million.

Vessel Traffic Services

Mandatory control of marine traffic in the most constricted and congested of the world's harbors is a proven marine safety concept in such ports as Tokyo Bay and Rotterdam. Washington's Puget Sound and Alaska's Valdez pipeline terminal also have mandatory control. Yet, despite continuing problems with non-participating vessels, traffic systems remain voluntary in such areas of the nation as New York Harbor, the lower Mississippi River, and Houston-Galveston.

Throughout its 17-year tenure, the Safety Board has made 57 safety recommendations that deal with Vessel Traffic Service (VTS). Its success has been mixed. The Board has sought mandatory VTS in New York Harbor, on the lower Mississippi River above and below New Orleans, and at Houston-Galveston.

The Coast Guard issued a notice of proposed rulemaking for mandatory VTS in Houston-Galveston in 1980, but has not completed the rulemaking, citing a 95 percent participation rate in the existing voluntary system.

In the New Orleans area, $3.35 million in improvements—three new short-range radar installations, closed-circuit TV and a VHF communications link for the entire system—have been approved. The Coast Guard also has requested funds for another six closed-circuit TV systems and for long-range radar on the lower Mississippi.

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New York's VTS history has foundered repeatedly because of budgetary constraints. The voluntary system for New York Harbor was shut down in April 1982 for lack of funds. Portions were scheduled to be reopened—still on a voluntary participation basis—on January 1, 1985, covering the primary Staten Island-Manhattan ferry routes and most of the harbor.

Even in Seattle and Valdez, many small vessels capable of participating in VTS do not take part in it, nor is their participation required. Because of this, and particularly where all participation is voluntary, near-collisions continue to occur as vessels remain undetected by others. Some of these encounters require dangerous evasive maneuvers.

Passenger ferries, commercial freighters, tankships, towboats—all have been involved in recent accidents. Vessels continue to collide in channel bends, for example, when even minor adjustments in speed could have eliminated their need to meet or pass in these confined areas. Improved radar, surveillance television monitors, real-time simulators and better communications could contribute significantly in future years to reducing such accidents.

Clearly there is a need to increase vessel participation in VTS, and to introduce the technological advances that hold promise of improved VTS effectiveness, particularly on U.S. inland waterways.

The U.S. tanker American Eagle, wracked by an explosion the day before, sinks in the Gulf of Mexico Feb. 27, 1984, after breaking up abruptly. The explosion killed three crewmembers. Two more died and two were missing in the sinking.

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Pipeline Safety

Twin safety problems—excavators damaging pipelines and causing explosions and fires, and gas companies' failure to shut down affected lines promptly—have plagued the pipeline industry for decades. Success in solving them has been mixed.

Rapid Shutdown

In September 1984, the Safety Board reported on a West Virginia accident that underscored the Board's repeated efforts to achieve rapid shutdowns after natural gas system ruptures—and before catastrophic explosions.

In South Charleston, West Virginia in October 1983, a backhoe, excavating for storm drain installation, punctured a three-inch diameter, 50-foot-long "stub" gas main and pulled apart the valve that connected it to a four-inch main. Under 45-pound pressure, natural gas vented into the atmosphere from the trench where the stub main had been snagged, and from roadside valve boxes. Columbia Gas Company personnel gave this their first attention, but gas also was migrating, undetected, under a blacktop parking lot and into a supermarket.

The Columbia gas crew could not find the broken valve on the

A five-minute delay between explosion and fire enabled all 18 persons in this devastated West Virginia supermarket to escape with their lives. Food shelves shielded many from the falling roof.

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four-inch main because it was seven feet underground, and their map did not show this. A "critical" nearby valve also was covered with soil and could not be found. Critical valves are intended for immediate use for emergency shutdowns. Measuring points similarly were buried, and a telephone pole that could have served this function no longer was in place.

The result of this textbook case of inability to shut down rapidly: More than two and one-half hours after the stub main was snagged, the supermarket exploded. Walls were blown out and the roof collapsed. Fortunately, food shelves kept the roof off the floor and all 18 persons in the store escaped before fire erupted five minutes after the initial blast.

The gas supply was not completely shut off for more than four hours after the excavation accident, and nearly an hour and a half after the supermarket exploded.

Safety Board investigators found that the highway project contractor had been given a map showing the three-inch gas main as abandoned. Actually, it was under pressure and "unnecessarily vulnerable to excavation accidents," as the Board put it in its report.

The Board urged Columbia Gas to review its system for monitoring continuing access to critical valves, to emphasize to supervisors the importance of knowledge of the exact location of the valves, and to train operating personnel to spot and report such shutdown difficulties as ground cover or missing pipeline markers.

The Board also recommended that the American Gas Association, the National L.P. Gas Association and the American Public Gas Association promote similar steps by all of their member companies.

One-Call Systems

Although the South Charleston near-disaster began with construction damage to a natural gas pipeline, it was not the classic case of a contractor blindly excavating without notifying anyone or attempting to locate any underground utilities in the area of excavation.

More than a decade ago, when excavation by so-called "third parties" was a leading cause of all natural gas accidents, a Safety Board study showed that such accidents could be reduced markedly if excavation contractors had an easy way to contact gas operators and other utilities whose underground lines would be threatened by the planned excavation. The Board found that several groups of utilities had achieved this by cooperatively establishing one telephone number, and a system under which one call by a contractor to that number would notify all companies that could be affected by the excavation. The Safety Board believed this innovative "one-call" concept should be a model for nationwide use, and called on the American Public Works Association to organize and promote one-call systems.

The results of the Board's recommendation, of its continuing promotion of the concept since 1973, and of the American Public Works Association's efforts, have been striking. Where there were a handful of systems in 1973, there were 110 in 1984. The systems provide statewide protection in 32 states. And the concept now has spread internationally; one-call systems are operating today in Canada, Scotland and the Republic of China.

Nor is there doubt of the effectiveness of one-call. In five years of operation of Cleveland's one-call system there was a 45 percent reduction in excavation-caused utility accidents. In two years, throughout Connecticut, the reduction was 38 percent. Generally, accident reductions have ranged from 40 to 75 percent. There is, of course, no measure of lives saved and injuries and property damage prevented.

One-call also may prove to have been the initiator of a new generation of advances in utility installation and management, as well as in safety. Some utilities are experimenting with common underground conduits and vaults,

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and with common, computerized mapping of lines and pipes. Whatever the economic and technical advantages of any such facilities prove to be, safety benefits would seem to be inevitable.

Hidden Hazard

The sprawling subdivisions that have brought home ownership to thousands of American families have brought with them, in some communities, an insidious pipeline safety hazard that is politically difficult to prevent: New residential lots are being sold and developed over or near pipelines that carry hazardous materials, and the new homeowners, in many cases, are unaware of the danger of digging on their property.

The liquefied natural gas pipeline that was struck in March 1983 during drilling for foundation planting around a mobile home near West Odessa, Texas, had been in place for 23 years. Subdivision of the area had not begun until 1981. Mid-America Pipeline Company, when it built the eight-inch pipeline through undeveloped and uncultivated land in 1960, had obtained a permanent easement to keep clear 25 feet of land on each side of it. The mobile home on the lot where the pipeline was struck by a power auger was about ten feet from the pipeline. Mid-America knew this, but said it had no legal right to require removal of temporary structures.

Although the company had exceeded federal requirements for marking the line, Board investigators found that many of the residents of the subdivision had not been aware of the pipeline, or of its potential hazard. The lot owner, who with five others was killed in the explosion and fire caused by the auger gouging the pipe, had received no written information about the pipeline easement, nor had other "time" purchasers of lots in the subdivision.

"No system of accountability exists for ensuring that information on pipelines is provided to land planning and use approval agencies or to prospective purchasers or occupants of land crossed by pipelines," the Safety Board said in its May 1984 report on the Odessa accident.

The Board recommended that the Transportation Research Board of the National Academy of Sciences study the adequacy of existing public policy in preventing new developments over or near existing pipelines used to move hazardous materials, and to develop recommended policy wherever needed. The Board said the extensive research needed in such a study best could be done by the academy's research board.

Plastic Pipe

Plastic pipe has been inserted into or has replaced cast iron pipe in hundreds of miles of natural gas distribution systems in the United States. It is commonplace in new and extended distribution systems. But it has been shown to be not without its own safety problems. It does not corrode, but sections of it can pull apart, and it can split.

In a June 1984 report, the Safety Board found that failure of a substandard joint between lengths of plastic pipe that had been joined only a year earlier had caused the July 1983 natural gas explosion and fire that destroyed an apartment building in Clear Lake, Iowa. Investigation showed that when service had been extended, pipe was added to the end of an existing line by means of a butt heat-fusion process. This involves heating pipe ends and compressing them while they fuse as the plastic cools.

The Board found that at Clear Lake, the joint appeared to be properly fused, and had passed a pressure test before the pipe was put in service. But it proved to be a "cold weld" that resulted from insufficient heat or pressure, or insufficient time for the fusion to "cure."

The Safety Board recommended that the American Gas Association urge member companies to reevaluate their plastic pipe fusion procedures, and to be sure personnel reponsible for them are following procedures explicitly. The Association reported in October 1984 that it had contacted its member companies, and that utility representatives were continu-

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ing to work with the Gas Research Institute on guidelines for fusion of joints and on satisfactory nondestructive testing of fusion joints.

In September 1984, an explosion and a natural-gas-fed fire destroyed two apartments in Phoenix, Arizona. Twelve persons were injured; five of them later died.

The Phoenix Fire Department responded, but did not call Arizona Public Service Company, the operator of the gas distribution system, even though fire continued at ground level and bubbles of gas rose through water that had collected on paved areas adjoining the destroyed apartments.

Excavation of the ABS plastic main showed a three-inch-long longitudinal split on the bottom of the pipe. Pressure at the time of the explosion had been 39 pounds per square inch. Company records contained no reports of gas odors in the neighborhood. Residents said gas odor had been detected 3½ hours before the 3 a.m. explosion, but no one had reported it to the gas company.

At year's end, the Safety Board was analyzing the factual record of the investigation for answers to questions about (1) factors involved in the plastic pipe failure at Phoenix, and the failure history of all ABS plastic pipe, (2) company records on previous plastic pipe failures, and (3) the adequacy of gas company and fire department coordination during emergencies.

Little but charred rubble remains of two apartments in Pheonix, Ariz. that were destroyed by an explosion and natural-gas-fed fire in September 1984. Twelve persons were injured. Five later died.

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Hazardous Materials

Driver Qualification

The Safety Board long has been concerned over the qualifications of drivers of trucks carrying hazardous materials.

The National Driver Register (NDR) was authorized by Congress in 1960 to help the states in identifying driver license applicants whose driving privileges had been suspended because of an alcohol-related traffic offense. It was expanded several years later to cover suspension for any serious traffic violation or series of violations. But the NDR soon proved to be seriously flawed. It was not available to motor carriers as they sought to screen driver applicants, and its response time was too sluggish to keep up with state driver licensing and record systems which permitted most states to issue a license on the day of application.

In 1980, the Safety Board studied the records of 44 truck drivers suspected to be the sort of "problem" driver many had hoped would be identified by NDR in time for prospective new employers to turn him or her down as a bad risk. The 44 drivers were found to have held, collectively, at least 63 driver licenses. They had been involved in at least 104 accidents, and had compiled records of at least 98 license suspensions and 456 traffic convictions. The accidents involved had resulted in 51 fatalities.

In regular investigations of hazardous materials accidents, the Board found the same frightening driver records—at least 11 license suspensions, 33 accidents and 69 traffic convictions among the drivers involved in just 14 hazardous materials crashes. The toll in the accidents was 61 fatalities and 283 injuries.

Most harrowing of all, perhaps, was the tractor-semitrailer truck loaded with 18 missiles and warheads that ran off a California road in 1982, sheared a utility pole, overturned, and spilled a bundle of missiles. Fortunately, there were no explosions. The driver admitted he had been drinking, and had fallen asleep at the wheel. Investigators found he had at least 14 traffic convictions in three states, including drunk driving, reckless driving, fleeing a police officer and holding a fictitious license. He was facing prosecution for burglary, and had served seven months for burglary and theft as a teenager.

A somewhat similar accident in 1984 prompted the Safety Board to convene a three-day public hearing in Denver, Colorado. A tractor-semitrailer carrying six Navy torpedoes failed to negotiate the curve of a ramp connecting Interstates 25 and 70 near downtown Denver at 4:50 a.m. on August 1. There were no fatalities, but concern over the 27,354 pounds of Class A explosives in the truck's cargo caused local officials to close the key interstate interchange to traffic. It was eight hours before it was reopened, and the resulting traffic jams on other highways were massive.

In addition to emergency response, the safety of the ramp, the hazards of shipping torpedoes, and hazardous material routing, the December hearing explored driver qualification for hazardous materials operations. The driver of the accident truck proved to be a graduate of a professional driving academy, a seven-week course for over-the-road truck drivers, who had had no prior truck driving experience, and went to work as a driver after completing the course. The driver's first load of Class A explosives came within one week of being employed. At the time of the Denver accident, the driver had driven a truck a total of 8,227 miles of driving, of which 3,659 miles—almost 45 percent—involved carrying Class A and B explosives.

As 1984 drew to a close, there were new signs of progress toward the Safety Board's goal of special licensing of hazardous materials truck drivers. California adopted new requirements that were to take effect in 1985. Faced with the prospect of having to meet varying licensing standards in the individual states, industry voices were raised for uniform federal action. There was a strong indication that the Federal Highway Administration (FHWA) was close to issuance of a notice of

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proposed rulemaking on federal motor carrier safety regulations that would seek specific comment on the Safety Board's recommendations for special hazardous materials driver licensing. FHWA was expected to ask for opinions not only on special licensing and on criteria for special driver training, but also on possible interim requirements pending completion of an in-depth study.

Hazardous Wastes—A New Problem

A hazardous waste spill on March 6, 1984 that prompted the evacuation of a three-square-mile area of Orange County, Fla. underscored an emerging transpor-

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tation safety problem. The threat of hazardous materials spills to nearby residents was no novelty. But this spill occurred because:

—The shipper did not sample his acid wastes before shipping them, did not detect changes, and did not specify a cargo tank that should be used to move the actual acid waste mixture safely.

—The waste disposal company also did not know the exact nature of the shipment of waste acids, and used a cargo tank that was not compatible.

The tank contained 3,200 gallons of mixed waste acids. It was parked at an Orange County truck dealership, where the driver was seeking help with a mechanical problem with the tractor, when the acids ate through the tank's unlined stainless steel shell and produced hazardous vapors. Twelve persons were injured before the evacuation of some 250 persons.

Board investigators also found that (1) the driver's information about the cargo in his own truck was inadequate; (2) emergency forces did not have adequate information about the waste acids cargo that had been spilled and was threatening the neighborhood; and (3) the carrier and the shipper were unable to respond promptly to emergency personnel questions about the wastes.

The Board conducted a two-day public hearing on the accident, and was analyzing the record of the case at year's end. Recommendations for precise identification of such hazardous waste materials clearly were in prospect for the Board's report.

Toxic Catastrophe

The catastrophic industrial accident that took more than 2,000 lives in Bhopal, India, on Dec. 3, 1984, was thousands of miles removed from the United States and its transportation system. But the safety issue it posed was an all too familiar one in transportation—classification of a highly toxic chemical according to its flammability, not its toxicity.

On December 19, 1984, the Safety Board pointed out in a letter to the Department of Transportation that methyl isocyanate (MIC), the toxic chemical released at Bhopal, could be shipped by rail in the United States in the least protected of tank cars, under DOT's existing classification of hazardous materials. Although Union Carbide, the only U.S. manufacturer and shipper of MIC, chooses to ship it in double-walled, insulated, stainless steel cars, and thus fully controls its distribution, "this is not true of other materials which pose similar toxic threats in the event of a transportation emergency."

DOT's hazard identification and classification system "must identify completely the hazards posed to life and health by each material during normal transportation and during emergencies," the Board wrote, "because this knowledge influences greatly decisions made about the level of protection required for containers used in transporting materials and influences public safety protection measures" at accident sites.

The Board noted that of five safety recommendations it had made over a nine-year period, one was particularly appropriate in the aftermath of Bhopal. That recommendation urged a review of Class A poisons and specialty products to determine if their toxicity hazards were sufficient to require that they be transported only in DOT 111 tank cars with head shields and thermal insulation. The Federal Railroad Administration promised such a review, but in completing a rulemaking in January 1984, it had not assessed the hazards to public safety of the toxicity of transported materials.

In its Dec. 19, 1984 letter to DOT's Research and Special Programs Administration, the Safety Board urged, "as a priority action, the identification of those materials now being transported that . . . can pose life-threatening hazards to the public" because of their toxicity, not just their flammability.

Six Navy torpedoes, with 27,354 pounds of Class A explosives, are on this truck that failed to make the turn on an interstate interchange ramp at Denver in 1984. The interchange was closed for eight hours, jamming traffic on other highways. (Denver Post photo)

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Legislation

Aviation and rail safety issues dominated Safety Board Congressional testimony in 1984.

National Airport Approach

The first hearing at which the Board testified before a House Committee about aviation highlighted one of the Board's success stories for the year—significant improvement of an instrument approach to Washington's National Airport.

The problem first was demonstrated—publicly and forcefully—in December 1982 when a Piedmont Boeing 737 flew too close to a high-rise office building in Rosslyn, Virginia while making an instrument approach to Washington National's Runway 18. Safety Board investigation disclosed the need for vertical guidance on the approach, and for new procedures that also would aid flightcrews in maintaining sufficient altitude as their planes passed Rosslyn.

The Federal Aviation Administration's initial reaction to four Safety Board recommendations in 1983 was negative, but the Board pressed the issue as further incidents occurred. Early in 1984, Chairman Jim Burnett was able to testify before the House Subcommittee on Transportation, Aviation and Materials that three of the four recommendations were being fulfilled. The fourth was reconsidered and withdrawn by mutual agreement of the two agencies.

Railroad Drug and Alcohol Abuse

Testifying before the Senate Surface Transportation Subcommittee, Vice Chairman Patricia A. Goldman reiterated forcefully a long-standing Safety Board recommendation that the Federal Railroad Administration (FRA) promulgate a regulation prohibiting the use of alcohol and drugs by employees for a specific period before reporting to duty and while on duty, much like the Federal rules that have applied in aviation for many years.

The Safety Board also recommended that FRA require railroad management to improve supervision of train crew members; that timely toxicological tests be performed on all operating employees involved in a fatal accident, a passenger train accident and any rail accident where there was an injury, a release of hazardous materials or substantial property damage. In addition, the Board urged that FRA and the railroad industry require full reporting of possible alcohol/drug-involved accidents. At the close of 1984, the long promised FRA rule on alcohol and drug use had yet to be issued.

Aviation Deregulation

In June, Chairman Jim Burnett testified before the House Government Activities and Transportation Subcommittee on how aviation safety may be affected by financial difficulties facing the airline industry. While acknowledging that deregulation has brought about highly competitive fare wars and resulted in some airlines declaring bankruptcy, Chairman Burnett testified that safety conclusions could not be drawn from airline ledger sheets. If safety corners had been cut—and that was and always had been a possibility—it was not reflected in accident data, the Chairman said. In fact, accident rates for both small and large airlines under Part 121 improved significantly between 1978 and 1983.

Burnett concluded that, by and large, the system of regulation, checks and balances and surveillance was working. There are exceptions, but the answer lies not in economic re-regulation but in better and more aggressive surveillance and enforcement of safety regulations.

Drunk Driving

On the same day in June Chairman Burnett testified before the Senate Surface Transportation

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Subcommittee on the serious problem of drunken driving on the nation's highways. Citing the fact that roughly 53-58 percent of all highway fatalities each year involve alcohol—approximately 22,500 deaths—Chairman Burnett recounted Safety Board efforts to promote actions on the federal, state and local levels to reduce alcohol involved highway accidents.

These efforts include encouraging states to raise the legal age for drinking or purchasing alcohol to 21 years, implementation in all states of the REDDI program (Report Every Drunk Driver immediately), more frequent arrests and stricter penalties for drunk driving incidents, and implementation of sobriety checkpoints and administrative license revocation. For the long term, the Chairman cited the need for prevention-education programs in schools and communities to develop responsible attitudes toward the use of alcohol and driving.

Wind Shear Detection

In testimony before the House Transportation, Aviation and Materials Subcommittee, Chairman Burnett cited weather as one of the greatest threats to aviation safety—the one factor over which man has no control. Of all weather phenomena, wind shear is one of the most difficult to detect, he said.

The Safety Board has made many recommendations to FAA on wind shear detection, and on training of pilots to cope with it. Although significant research and development efforts have been undertaken, the Safety Board is discouraged that more tangible benefits have not resulted from these efforts. The only operational wind shear detection system implemented thus far is the Low Level Wind Shear Alert System (LLWAS), an anemometer array around an airport that alerts the tower controller to shifting ground level winds. The limitations of this system are acknowledged, and it has been adopted as an interim measure only until more sophisticated equipment is developed.

The Chairman expressed the Safety Board belief that both advance warning and adequate pilot training are vitally important ingredients to avoid the type of catastrophic wind shear accidents that have taken hundreds of lives over the past several decades.

Amtrak Safety

Concern for the Safety of AMTRAK passengers following several highly publicized accidents and incidents was the subject of a Senate Surface Transportation Subcommittee hearing in July. Vice Chairman Goldman appeared on behalf of the Board to discuss such issues as track safety standards and inspection, weather effects on track, and train communications. The hearing was punctuated, coincidentally, by the head-on collision the day before of two AMTRAK trains in Queens, New York, that resulted in one fatality and many injuries.

Vice Chairman Goldman expressed frustration on the part of the Board that deficiencies in the federal rules governing railroad operations are found, recommendations to eliminate them are made, yet action is slow in coming—if it takes place at all.

Aircraft Cabin Safety

Few issues have been as frustrating to the Board as has FAA's lack of progress in improving the safety of the cabin environment of commercial aircraft. Testifying before the House Aviation Subcommittee on the subject, Chairman Burnett reiterated numerous recommendations the Board has made over the years from its accident investigations on both fire safety and crashworthiness. The

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Chairman commented on three pieces of legislation before the Subcommittee and urged early FAA action on new cabin safety regulations.

Air Traffic Control

Since the air traffic controller strike in August 1981, the system has been under close scrutiny by all facets of the aviation industry. In view of the concern of many that the air traffic control system was not operating at optimum capacity, the Safety Board added to its accident investigation agenda a review of near mid-air collision incidents which had a potential for illustrating possible safety measures. Testifying before the Senate Aviation Subcommittee, Vice Chairman Goldman outlined the Safety Board's investigative activities since the strike, including the findings of two special investigations undertaken by the Board in 1984. She reported that the most significant conclusion from the studies was that the system had operated safely during the immediate post-strike period, but that continued safe operation would depend on the capability of the controller staff to manage properly the growing volume of air traffic.

The Vice Chairman expressed the Safety Board's concern that free access to the ATC system is leading to saturation problems that can be solved only partially by increasing controller staffing. If the only effective short-term solution is to reimpose steps to limit access to the ATC system, then the FAA must be prepared to bite that bullet, she said.

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Management

Management emphasis throughout 1984 continued to be placed on maximum safety impact from all Board activities. Productivity was measured not only in terms of efficiency, but—more importantly—by real-world safety accomplishments.

Issues-oriented investigation programs, begun in previous years, began to pay dividends. Special emphasis on "ultralights" enabled the Board to complete an in-depth analysis of this emerging problem area. Based on the lessons learned from 177 accidents, 88 of which were fatal, safety recommendations were included in a report that was to go to the Board for final action early in 1985.

In highway safety, the Board's program to promote child safety seats was redirected because all but one state had passed a mandatory use law by year's end. Therefore, the Board concentrated its efforts on ensuring that the laws actually resulted in increased use, as well as on solving the problem of misuse.

The Board also continued its efforts to reduce drunk driving. It promoted sobriety check points and administrative license revocation procedures at the state level. At the same time, it completed an evaluation of the "repeat offender" problem based on the investigation of 51 accidents involving drunk drivers, 45 of them fatal accidents. As a result of the study, ten safety recommendations were issued to the states and several to the National Highway Traffic Safety Administration and national judicial organizations.

The railroad field program was rebuilt during the year so that six of the ten Safety Board field offices now have rail investigators. This enabled the Board to conduct a special investigation of fire problems in the New York subway system and to begin an in-depth examination of the grade crossing problem.

The Human Performance Division, which completed its first full year of work in 1984, participated in the on-scene phase of numerous investigations in all modes, and made significant contributions to the Board's reports. As a result, the Board is achieving far more thorough understanding of the underlying reasons for the human errors it finds in accident causation.

The Board in 1984 also:

—Designed and installed a Board-wide microcomputer system to increase Board productivity. This system allows the transfer of data among Board units, including field offices, and between these units and the mainframe computer. The system will allow the Board to eliminate multiple input of information, as well as provide the capability to more directly analyze data.

—Enhanced the capabilities of its laboratory computer through hardware acquisitions and the development of specialized software. The use of the computer to retrieve and process air traffic control radar data has resulted in improved accident analysis. The reconstruction of the sequence of events during a midair collision, for example, can now be performed using the computer.

—Designed and implemented one of the most advanced accounting systems in government. This system improved the productivity of the Board staff through the automation of time consuming manual tasks. It has been recognized by the Office of Management and Budget as one of the five best government accounting systems. As a result, NTSB will be providing accounting system support to other government agencies, on a contract basis, thus reducing the overall number of accounting systems in government.

—Established a new aviation accident investigation school at Oklahoma City to provide training for NTSB employees in basic and advanced accident investigation techniques. This school not only will allow the Board to provide uniform accident investigation training to NTSB employees, but also will provide accident investigation training to limited numbers of foreign, state, and local government officials, and industry transportation officials who assist the Board in its aviation accident investigation efforts.

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Certificate and License Appeals

The Safety Board serves as the "court of appeal" for any airman or mariner whenever certificate action is taken by the Federal Aviation Administrator or the U.S. Coast Guard Commandant.

Under the Independent Safety Board Act of 1974, the Board's administrative law judges hear, consider and issue initial decisions on appeals from FAA certificate actions. The judges have the option to issue either an initial decision from the bench at the conclusion of the hearing, or to write a decision after review of the verbatim transcript of the hearing and review of exhibits. About 10 percent of the judges' decisions are written. Judges' decisions may be appealed to the five-member Board by the airman or FAA.

The Board's review of the appeal encompasses the transcripts of the proceeding, the judge's decision, and appeal briefs submitted by the parties.

The final decision of the full Board is subject to judicial review by the U.S. Court of Appeals. However, the right of appeal to the U.S. Court of Appeals is only extended or granted to the airman. The FAA cannot appeal to the Courts. Upon review, the Court has the power to affirm, modify or set aside the full Board's Opinion and Order, in whole or in part; and if need is found, to order further proceedings by the Board. The judgment and decree of the Court of Appeals is subject to review by the Supreme Court of the United States.

Marine certificate action appeals are heard first by Coast Guard Administrative Law Judges, and may be appealed to the Commandant of the Coast Guard. The ruling of the Commandant may be appealed to the Safety Board, where the Board follows the same process as in considering the initial decisions of its law judges in aviation cases. There were eight marine appeals filed at the Safety Board in 1984, and nine were closed.

Six hundred and five aviation license appeals were filed with the Office of Administrative Law Judges in 1984. The judges closed 570 cases—234 after a full hearing on the merits and 336 by order terminating the proceeding. Sixty-eight emergency cases were filed and concluded. The judges held 274 hearings; all were held outside of Washington, D.C. Of the 234 decisions rendered by the judges, 134 were appealed to the Board for review. The judges were reversed by the Board in only eight cases. Seven decisions were appealed to the U.S. Court of Appeals. The Court rendered nine decisions in 1984; the Board was affirmed in all nine of the cases.

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Appendix A

Accidents, Fatalities, and Rates
Air Carriers and General Aviation
1984 (Preliminary Data)

	Accidents					Accident Rates			
						Per 100,000 Aircraft Hours		Per 100,000 Departures	
	Total	Fatal	Fatalities	Aircraft Hours Flown	Departures	Total	Fatal	Total	Fatal
Air Carriers									
Air Carriers Operating Under 14 CFR 121									
Scheduled	12	1	4	7,302,000	5,354,000	0.164	0.014	0.224	0.019
Nonscheduled	3	0	0	310,000	143,000	0.968	0.	2.098	0.
Air Carriers Operating Under 14 CFR 135									
Scheduled **	21	7	45	1,757,000	2,697,000	1.20	0.40	0.78	0.26
Nonscheduled	140	22	51	3,328,000	*	4.21	0.66	—	—
General Aviation +	2999	529	998	30,541,000	*	9.82	1.73	—	—

+ Includes accidents involving aircraft flown under rules other than 14 CFR 121 and 14 CFR 135.

* Data not available.

** Rates are based on all accidents, including those involving operators not reporting traffic data to the CAB. Exposure data estimate sources: CAB and FAA.

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Appendix B

Accidents, Fatalities, and Rates
U.S. Air Carriers Operating Under 14 CFR 121
All Scheduled Service
(Airlines*)
1975-1984

	Accidents						Accident Rates					
							Per Million Aircraft Miles		Per 100,000 Aircraft Hours		Per 100,000 Departures	
Year	Total	Fatal	Fatalities	Aircraft Miles Flown #	Aircraft Hours Flown #	Departures #	Total	Fatal	Total	Fatal	Total	Fatal
1975	31	2	122	2,240,505,000	5,422,665	4,704,052	0.014	0.001	0.572	0.037	0.659	0.043
1976	22	2	38	2,319,967,000	5,587,601	4,835,138	0.009	0.001	0.394	0.036	0.455	0.041
1977	21	3	78	2,418,652,000	5,800,843	4,934,094	0.009	0.001	0.362	0.052	0.426	0.061
1978	21	5	160	2,520,165,080	6,031,743	5,015,939	0.008	0.002	0.348	0.083	0.419	0.100
1979	24	4	351	2,736,129,000	6,700,322	5,379,852	0.009	0.001	0.358	0.060	0.446	0.074
1980	15	0	0	2,816,303,000	6,797,578	5,352,927	0.005	0.	0.221	0.	0.280	0.
1981	25	4	4	2,703,219,000	6,571,288	5,211,867	0.009	0.001	0.380	0.061	0.480	0.077
1982	15	3	233	2,698,928,000	6,440,163	4,963,794	0.006	0.001	0.233	0.047	0.302	0.060
1983	21	4	15	2,797,938,000	6,625,536	5,009,276	0.008	0.001	0.317	0.060	0.419	0.080
1984P	12	1	4	3,092,000,000	7,302,000	5,354,000	0.004	0.0003	0.164	0.014	0.224	0.019

P Preliminary data.

* Includes accidents involving deregulated all cargo air carriers and commercial operators of large aircraft when those accidents occurred during scheduled 14 CFR 121 operations.

Exposure data estimate source: CAB

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Appendix C

Accidents, Fatalities, and Rates
U.S. Air Carriers Operating Under 14 CFR 135
All Scheduled Service
(Commuter Air Carriers #)
1975-1984

	Accidents						Accident Rates **					
							Per Million Aircraft Miles		Per 100,000 Aircraft Hours		Per 100,000 Departures	
Year	Total	Fatal	Fatalities	Aircraft Miles Flown *	Aircraft Hours Flown *	Departures *	Total	Fatal	Total	Fatal	Total	Fatal
1975	48	12	28	160,465,760	936,312	1,455,563	0.30	0.07	5.13	1.28	3.30	0.82
1976	35	9	27	171,471,894	965,296	1,532,425	0.20	0.05	3.63	0.93	2.28	0.59
1977	44	9	32	201,282,211	1,150,250	1,740,502	0.22	0.04	3.83	0.78	2.53	0.52
1978	61	14	48	226,186,596	1,302,136	1,995,728	0.27	0.06	4.68	1.08	3.06	0.70
1979	52	15	66	192,492,929	1,169,921	1,883,705	0.27	0.08	4.44	1.28	2.76	0.80
1980	38	8	37	192,200,134	1,175,588	1,776,999	0.20	0.04	3.23	0.68	2.14	0.45
1981	31	9	34	193,000,863	1,240,764	1,835,144	0.16	0.05	2.50	0.73	1.69	0.49
1982	27	5	14	222,355,000	1,300,000	2,027,000	0.12	0.02	2.08	0.38	1.33	0.25
1983	17	2	11	253,572,000	1,511,000	2,328,000	0.07	0.01	1.13	0.13	0.73	0.09
1984P	21	7	45	289,326,000	1,757,000	2,697,000	0.07	0.02	1.20	0.40	0.78	0.26

P Preliminary data.

* Exposure data estimates from CAB.

** Rates are based on all accidents including some involving operators not reporting traffic data to the CAB.

Includes accidents involving all-cargo air carriers when those accidents occurred during scheduled 14 CFR 135 operations. All-cargo air carriers no longer meet the CAB definition for "Commuters." May also include accidents involving carriers whose FAA operating specifications permit scheduled revenue operations under 14 CFR 135, but who have not received a CAB fitness determination.

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Appendix D

Accidents, Fatalities, and Rates
U.S. Air Carriers Operating Under 14 CFR 135
Nonscheduled Operations
(On-Demand Air Taxis)
1975-1984

	Accidents				Accident Rates Per 100,000 Aircraft Hours	
Year	Total	Fatal	Fatalities	Aircraft Hours Flown *	Total	Fatal
1975	152	24	69	2,526,271	6.02	0.95
1976	137	31	100	2,703,203	5.07	1.15
1977	158	31	118	3,304,220	4.78	0.94
1978	198	54	155	3,545,753	5.58	1.52
1979	160	30	77	3,684,321	4.34	0.81
1980	170	45	103	3,617,724	4.70	1.24
1981	157	40	94	2,895,827	5.42	1.38
1982	135	31	72	3,256,763	4.15	0.95
1983	144	28	62	2,574,883	5.59	1.09
1984P	140	22	51	3,328,000	4.21	0.66

P Preliminary data.

* Source of estimate: FAA

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Appendix E

Accidents, Fatalities, and Rates
U.S. General Aviation +
1975-1984

	Accidents			Accident Rates * Per 100,000 Aircraft Hours		
Year	Total	Fatal	Fatalities #	Aircraft Hours Flown **	Total	Fatal
1975	4001	636	1258	28,799,000	13.89	2.20
1976	4023	662	1226	30,476,000	13.19	2.17
1977	4083	663	1280	31,577,508	12.93	2.10
1978	4218	721	1558	34,887,178	12.08	2.06
1979	3825	638	1237	38,641,268	9.90	1.65
1980	3597	622	1252	36,401,663	9.88	1.71
1981	3502	654	1282	36,803,200	9.52	1.78
1982	3230	589	1182	32,094,623	10.05	1.84
1983	3091	547	1046	31,047,548	9.96	1.76
1984P	2999	529	998	30,541,000	9.82	1.73

P Preliminary data.

+ All operations other than those operated under 14 CFR 121 and 14 CFR 135.

* Suicide/sabotage accidents included in all computations except rates (1975 - 2, 1976 - 4, 1977 - 1, 1978 - 2, 1979 - 0, 1980 - 1, 1981 - 0, 1982 - 3, 1983 - 0).

Includes air carrier fatalities when in collision with General Aviation aircraft.

** Source of estimate: FAA.

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Appendix F

Fatal Accidents and Fatalities
U.S. Air Carriers Operating Under 14 CFR 121
All Scheduled Service
(Airlines)
1984 (Preliminary Data)

Date	Location	Operator	Service	Aircraft	Fatalities: Psgr	Crew	Other	Total	Total Aboard	Reported Type of Accident
5/30	Chalkhill, PA	Zantop Int'l	Cargo	Lockheed 188A	1	3	0	4	4	In-flight breakup during cruise at 22,000 feet.

Fatal Accidents and Fatalities
U.S. Air Carriers Operating Under 14 CFR 135
All Scheduled Service
(Commuter Air Carriers)
1984 (Preliminary Data)

Date	Location	Operator	Service	Aircraft	Fatalities: Psgr	Crew	Other	Total	Total Aboard	Reported Type of Accident
3/5	Cumberland, MD	Nicholson Air Service	Psgr	Piper PA-31	2	1	0	3	3	Collided with mountain during instrument approach.
7/21	Tau, Manua Island American Samoa	South Pacific Island Airways	Psgr	DeHavilland DHC-6	1	0	0	1	14	Collided with the terminal building and a parked vehicle during landing approach.
8/2	Vieques, PR	Vieques Air Link	Psgr	Britten Norman BN-2A Islander	8	1	0	9	9	Crashed into the ocean shortly after takeoff.
8/24	San Luis Obispo, CA	Wings West Airlines	Psgr	Beech 99	13	2	2	17	15	Midair collision with a Rockwell 112 (2 fatalities aboard that aircraft).
9/7	Naples, FL	Provincetown-Boston Airlines	Psgr	Cessna 402C	1	0	0	1	6	Crashed and burned during a forced landing following power loss in both engines.
12/6	Jacksonville, FL	Provincetown-Boston Airlines	Psgr	Embraer 110-P1	11	2	0	13	13	Airframe failure shortly after takeoff.
12/17	Bainbridge, NY	Ford Aire	Psgr	Piper PA-23	2	2	0	4	4	Collided with trees during landing approach.

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Appendix G

Major Aviation Investigations

Aviation Team

Operator/Aircraft	Type/Location	Date
Pilgrim Airlines Fairchild F-27	Takeoff New York, N.Y.	1/18/84
Britt Air Swearingen-Merlin 4	Takeoff Terre Haute, IN	1/30/84
Gee Bee Aero, Inc. Learjet 24	Landing Santa Catalina Island, CA	1/30/84
SAS McDonnell Douglas DC-10	Landing New York, N.Y.	2/28/84
Eastern Airlines Boeing 727 Pan American World Airlines Boeing 727	Approach Washington, D.C.	3/8/84
Turbine Air Management Mitsubishi MU-2	Takeoff Burlington, CT	4/19/84
Air Traffic Control Operational Error	Inflight Near Harrisburg, PA	5/9/84
Zantop International Lockheed L-188A	Inflight Chalkhill, PA	5/30/84
United Airlines, Inc. Boeing 727-200	Landing Denver, CO	6/1/84
Air Continental, Inc. Learjet 23	Landing Windsor Locks, CT	6/5/84
USAir, Inc. McDonnell Douglas DC-9-31	Landing Detroit, MI	6/13/84
Tradewinds Airlines Boeing 707	Landing Chicago, IL	6/23/84
Eastern Airlines Boeing 727/ USAF KC-135	Inflight (Near Midair) Near Atlanta, GA	7/16/84
Vieques Air Link Brittain-Norman BN-2	Takeoff Isla De Vieques, P.R.	8/2/84
Wings West Beech 99/ Aesthetec Rockwell 112	Inflight (Midair) San Luis Obispo, CA	8/28/84
USAir, Inc. McDonnell Douglas DC-9	Landing Erie, PA	10/14/84

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Appendix G

Aviation Field

Operator/Aircraft	Type/Location	Date
United Airlines Boeing 747	Takeoff Honolulu, HA	11/16/84
PBA, Inc. Embraer Bandeirante E110	Takeoff Jacksonville, FL	12/6/84
Air Resorts International Convair 440	Inflight Jasper, AL	12/16/84
Skycraft Air Transport Douglas DC-3	Climb St. Louis, MO	1/9/84
Bernard A. Lafferty Beech V35B	Approach Charlottesville, VA	2/17/84
Valdez Airlines Embraer EMB-110-P1	Landing Cordova, AK	2/22/84
Anderson Tile/Carpet Distrib. Cessna 421B	Approach Cullman, AL	3/5/84
Nicholson Air Service Piper PA-31	Approach Cumberland, MD	3/5/84
Maxwell-Gunter AFB Aero Club Piper PA-28RT-201	Maneuvering Hood River, OR	3/12/84
Paul E. Bleile Company Piper PA-34-220T	Approach Mount Airy, GA	4/23/84
G & J Leasing Company Piper Aerostar 601P	Descent Cockeysville, MD	4/28/84
Mobile Home Estates, Inc. Cessna 340A	Descent Cincinnati, OH	6/20/84
Circle C. Farms Piper PA-32-300	Maneuvering Canton, GA	6/24/84
Clause Schroter Piper PA-31T	Descent Concord, CA	7/14/84
Beryle D. Brister Cessna 421C	Descent Fort Lupton, Co	8/1/84
Capital Equipment Assoc., LTD Sikorsky S76A	Cruise Fort Dix, NJ	8/11/84
James P. Demetry Aero Commander 690	Descent Little America, WY	8/25/84

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U.S. Participation in Foreign Investigations

Operator/Aircraft	Type/Location	Date
Pee Dee Air Express, Inc. Piper PA-31T	Approach Atlanta, GA	9/24/84
Clay Lacy Av., Inc. Gates Learjet 24B	Descent San Francisco, CA	10/8/84
Ucc Aviation, Inc. Bell 206B	Descent Riverside, CA	10/10/84
Pan American World Airways Boeing 747	Takeoff London, England	1/18/84
Pacific Western Airlines Boeing 737	Takeoff Calgary, Canada	3/22/84
Falcon 200 Avioni Marcel Dassault	Inflight Istres, France	4/2/84
USAF C141	Inflight Sicily, Italy	7/12/84
Air India Boeing 747	Takeoff Bankok, Thailand	6/30/84
Air France Boeing 737	Takeoff Paris, France	9/6/84
Aeca Airlines McDonnell Douglas DC8	Takeoff	9/18/84
Cameroon Airlines Boeing 737	Taxi Doriala, Cameroon	10/30/84
Petroleum Helicopter, Inc. Sikorsky S76A	Takeoff Near Hainan Island South China Sea	10/31/84

Highway-Team

Operator/Vehicle	Type/Location	Date
G&D Sales, Inc., Towtruck Towing Automobile/Branch Motor Express Company Tractor-Semitrailer/Town of Rehoboth Schoolbus;	Collision Rehoboth, MA	1/10/84
G&M Fuel Oil Truck	Fuel Leak & Fire Baltimore, MD	1/9/84

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Appendix G

	Operator/Vehicle	Type/Location	Date
	B&O Railroad; Passenger Car	Run-off Roadway onto Tracks Silver Spring, MD	2/20/84
	Carrsville Elementary Schoolbus; Chessie System train	Schoolbus/Train Collision Carrsville, VA	4/12/84
	Franger Bottle Gas Tractor; Grand Trunk Railroad	Truck/Train Collision La Porte, Indiana	4/20/84
	California Yearly Meeting of Friends Church Bus	Run-off Roadway Wofforc Heights, CA	7/7/84
	Denver, Colorado Springs, Pueblo Motorways, Inc. Intercity Bus/American Colloid Carrier Corporation Tractor-Semitrailer Truck	Rear End Collision Cheyenne, Wyoming	7/18/84
	Brown Transit, Inc., Tractor Semitrailer and Junction City Public School District Schoolbus	Rear End Collision Junction City, Arkansas	10/19/84
Highway-Field			
	1976 Peterbilt 2 Beile Trailers 1977 Chevy Superior Schoolbus	Head-On Collision Essex, MT	1/24/84
	1980 Semitrailer 1981 4-Door Chevrolet	Head-On Collision Ashdown, AR	7/5/84
	1968 Chevrolet Schoolbus; Florida East Coast Railroad	Grade Crossing Port St. Lucie, FL	9/27/84
Railroad-Team	**Train**	**Type/Location**	**Date**
	Conrail Freight Trains	Collision Saltsburg, PA	2/26/84
	Seaboard System Amtrak Passenger Train	Derailment Kittrell, N.C.	3/15/84
	Burlington Northern Amtrak Passenger Train	Grade Crossing Derailment Bainville, MT	3/15/84

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	Operator/Train	Type/Location	Date
	New York City Transit Authority Rapid Transit Train	Derailment East River Tube New York City, NY	3/17/84
	Burlington Northern Freight Trains	Collision Wiggins, CO	4/13/84
	Burlington Northern Freight Trains	Collision Newcastle, WY	4/22/84
	Burlington Northern Freight Trains	Collision Motley, MN	6/14/84
	Central Vermont Amtrak Passenger Train	Derailment Essex Jct, VT	7/7/84
	Amtrak Passenger Trains	Collision Queens, New York, NY	7/23/84
	Chicago Transit Authority Rapid Transit Trains	Collision Montrose Chicago, IL	8/17/84
Railroad-Field	Seaboard System Amtrak Passenger Train/Truck-Trailer	Grade Crossing Plant City, FL	1/24/84
	Union Pacific Freight Train/Auto	Grade Crossing Shelly, ID	1/27/84
	Metro North Commuter Trains	Collision Yonkers, NY	3/16/84
	St. Louis, Southwestern Freight Train/Truck-Trailer	Grade Crossing Malakoff, TX	3/30/84
	New York City Transit Authority Rapid Transit Train	Train Fire/Evacuation Queens New York, NY	4/17/84
	Atchison, Topeka & Santa Fe Truck Struck Train	Grade Crossing Lacon, IL	4/23/84
	Metro-Dade Transportation Authority Rapid Transit Trains	Collision Miami, FL	4/29/84

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Appendix G

Operator/Train	Type/Location	Date
Southern Pacific Amtrak Passenger Train/Auto	Grade Crossing El Monte, CA	5/4/84
Missouri Pacific Freight Train/Hazmat Tank Truck	Grade Crossing Avondale, CO	5/17/84
Chessie System Amtrak Passenger Train	Derailment Connellsville, PA	5/29/84
Massachusetts Bay Transportation Authority Rapid Transit Train	Train Fire Evacuation Boston, MA	6/11/84
Southern Pacific Freight Train/Police Car	Grade Crossing Williams, CA	7/2/84
Missouri Pacific Freight Train	Hazardous Material Leakage Ft. Worth, TX	7/10/84
Seaboard System Amtrak Passenger Train/ Gasoline Truck	Grade Crossing McBee, S.C.	7/11/84
Seaboard System Freight Train	Derailment, Hazardous Material Leakage Atlanta, GA	7/14/84
Conrail Freight Train	Collision Hazardous Materials Newark, NJ	8/4/84
Greater Cleveland Regional Transit Authority Rapid Transit Trains	Collision Cleveland, OH	9/10/84
Amtrak Work Train Conrail Local Freight Train	Rear End Collision Stamford, CT	10/17/84
Atchison/Topeka/Santa Fe/ Missouri Pacific Freight	Collision (RR Crossing) Alvarado, TX	10/21/84
Metropolitan Atlanta Rapid Transit Authority Rapid Transit Trains	Derailment Atlanta, GA	12/3/84

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Marine

Operator/Vessel	Type/Location	Date
Marine Equipment Co. U.S. Towboat DAVID CARLTON and L.S.T. Tankers Corp. Panamanian Bulk Carrier LIA	Collision Lower Mississippi River near Bringier Point, LA	2/7/84
American Foreign Steamship Corp. U.S. Tankship AMERICAN EAGLE	Explosion and Sinking Gulf of Mexico Southwest of New Orleans, Louisiana	2/26/84
Scandinavian World Cruises Bahamian Passenger Cruise Liner SCANDINAVIAN SEA	Fire Atlantic Ocean East of Port Canaveral, Florida	3/9/84
Private Owner U.S. 14-Foot Outboard Motorboat, NM312AA	Capsizing Elephant Butte Lake, Truth or Consequences, New Mexico	3/18/84
Mobil Oil Corporation U.S. Tankship MOBIL OIL	Grounding Columbia River near St. Helens, Oregon	3/19/84
Findett Transport Co. U.S. Towboat ERIN MARIE and twelve barges	Ramming of Poplar Street Bridge, Upper Mississippi River at St. Louis, Missouri	4/26/84
Greek Tanker Shipping Co., Ltd. Greek Tankship MANTINIA and Brent Towing Co., Inc., U.S. Towboat ANN BRENT with four barges	Collision Mississippi River near Vacherie, LA	6/11/84
Don Mutco Corp. U.S. Tugboat SEELOS and Tank Barge BG-476	Ramming of Lake Ponchartrain Causeway New Orleans, LA	6/23/84
SCI Corporation U.S. Sternwheeler Cruise Vessel SCITANIC	Capsizing Tennessee River Huntsville, AL	7/7/84
Lloyds Leasing Ltd. United Kingdom Tankship ALVENUS	Grounding Calcasieu Ship Channel, South of Cameron, LA	7/30/84

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Appendix G

Operator/Vessel	Type/Location	Date
Scandinavian World Cruises Bahamian Passenger/ Cargo Ro-Ro Ferry SCANDINAVIAN SUN	Fire Dodge Island Miami, FL	8/21/84
Kingfisher Cruise Lines, Inc. U.S. Passenger Vessel FANTASY ISLANDER	Fire Peace River near Punta Gorda, FL	9/8/84
Zapata Marine, Inc. U.S. Mobile Offshore Drilling Unit ZAPATA LEXINGTON	Well Blow Out and Fire Gulf of Mexico, South of Morgan City, LA	9/17/84
USCGC POINT HOPE and Amay S, Inc. U.S. Self-Propelled Lift Barge AMAY S	Capsizing of barge while being towed Gulf of Mexico East of Galveston, TX	10/17/84
Private Owner U.S. 20-Foot Inboard JET DRIVE WHISKEY RUNNER	Collision with Mooring Buoy, Anaheim Bay, CA	10/28/84
Union Oil Co. of California U.S. Tankship PUERTO RICAN	Explosion West of Golden Gate Bridge, San Francisco, CA	10/31/84
Ironside Trawling Corp. U.S. Fishing Vessel AMAZING GRACE	Vessel Overdue Possible Sinking Atlantic Ocean East of Cape Henlopen, DE	11/14/84
Island Park Tanker Corp. U.S. Tugboat CELTIC	Sinking Long Island Sound, South of Norwalk, CT	11/18/84

Pipeline-Team

Operator/Material	Type/Location	Date
Boston Gas Company Natural Gas	Explosion & Fire Brookline, MA	1/15/84
Arizona Public Service Co. Natural Gas	Explosion & Fire Phoenix, AZ	9/25/84
Texas Eastern Pipe Line Co. Natural Gas	Rupture & Fire St. Francisville, LA	11/26/84

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Pipeline-Field

Operator/Material	Type/Location	Date
UGI Corporation Natural Gas	Explosion & Fire Dauphin County, PA	1/10/84
New Jersey Gas Co. Natural Gas	Explosion & Fire Wharton, NJ	1/10/84
Washington Gas Light Co. Natural Gas	Explosion & Fire Washington, D.C.	1/13/84
Columbia Gas of Pennsylvania Inc. Natural Gas	Explosion & Fire York, PA	1/19/84
Equitable Gas Co. Natural Gas	Explosion & Fire Pittsburgh, PA	1/14/84
Lone Star Gas Co. Natural Gas	Asphyxiation Richardson, TX	2/8/84
Mobile Pipe Line Co. Natural Gas Liquids	Explosion & Fire Hurst, TX	2/28/84
Exxon Pipe Line Co. Gasoline	Pipe Rupture & Spill Missouri City, TX	3/25/84
Colorado Interstate Natural Gas Co. Natural Gas Gathering	Overpressure Fritch, TX	4/10/84
Washington Gas Light Co. Natural Gas	Fire Rockville, MD	6/19/84
Northern Plains Natural Gas Co. Natural Gas	Explosion & Fire Hebron, ND	7/19/84
Citizens Gas & Utilities Natural Gas	Explosion & Fire Indianapolis, IN	7/20/84
Southern California Gas Co. Natural Gas	Explosion & Fire Los Angeles, CA	8/1/84
Arizona Public Service Co. Natural Gas	Asphyxiation Glendale, AZ	8/27/84
Consolidated Edison Natural Gas	Explosion & Fire New York, NY	10/18/84
Alabama Gas Corporation Natural Gas	Explosion Birmingham, AL	10/22/84
ARKLA Gas Co. Natural Gas	Explosion & Fire Wichita, KS	12/15/84

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Appendix G

Hazardous Materials

Operator/Vehicle	Type/Location	Date
Seaboard Systems Railroad Tank Car	Derailment Involving Oleum Release Clay, KY	2/5-7/84
Chemical Waste Management Co./ Harris Semiconductor Highway Tank Truck	Waste Acid Release Orange County, FL	3/6/84
Southern Railroad Tank Cars	Derailment with Hazardous Materials Release Valdosta, GA	3/28/84
Seaboard Systems Freight Train	Derailment with Hazardous Materials Release Marshville, NC	4/10/84
Olympic Chemical Corp. Highway Tank Truck	Chlorine Release Oakland, CA	5/2/84
Reagans Vacuum Truck Service Highway Tank Truck	Waste Acid Release Santa Barbara, CA	5/14/84
Missouri Pacific Railroad Groendyke, Inc. Freight Train/Highway Tank Truck	Collision with Anhydrous Ammonia Release Avondale, CA	5/16/84
Davis Brothers' Highway Tank Truck	Waste Acid Release Port Gibson, MS	5/16/84
RISS International Highway Semi-trailer	Overturn with Torpedos Denver, CO.	8/1/84
Union Pacific Railroad Tank Car Failure	Release of Ethylene Oxide in Railyard North Little Rock, AK	12/31/84

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Appendix H

Public Hearings/ Deposition Proceedings Held in 1984

	Hearing/Deposition Place/Date	Accident	Accident Location/Date
Aviation			
	Romulus, Michigan 7/16/84	USAir, Inc. DC-9	Detroit, MI 6/13/84
	San Luis Obispo, CA 11/1/84	Wings West BE99/ Aesthetic Rockwell 112	San Luis Obispo, CA 8/24/84
Railroad			
	Marshall, TX 3-6-84	Derailment Amtrak Passenger Train	Woodlawn, TX 11/12/83
	Brooklyn, NY 4-30-84	Derailment NYCTA Rapid Transit Train	East River Tube 3/17/84
	Denver, CO 6-4-84	Collision Burlington Northern Freight Trains	Wiggins, CO 4/13/84 & New Castle, WY 4/22/84
	Superior, WI 8-21-84	Collision Burlington Northern Freight Trains	Motley, MN 6/14/84
	St. Albans, VT 9-14-84	Derailment Amtrak Passenger Train	Essex Jct, VT 7/7/84
	New York, NY 10-11-84	Collision Amtrak Passenger Trains	Queens New York, NY 7/23/84
	Chicago, IL 11-1-84	Collision Chicago Transit Rapid Transit Trains	Chicago, IL 8/17/84
Marine	St. Louis, MO 6/11/84	Ramming of Poplar Street Bridge by Towboat ERIN MARIE and twelve barges	St. Louis, MO 4/26/84
	Portsmouth, VA 12/19/84	Sinking of Fishing Vessel AMAZING GRACE	Atlantic Ocean, East of Cape Henlopen, DE 11/14/84
Hazardous Materials	Orlando, FL June 5-6, 1984	Chemical Waste Mgt. Co./ Harris Semiconductor Waste Acid Release	Orange Co., FL 3/6/84
	Denver, CO November 27-29, 1984	RISS International Overturn with Torpedos	Denver, CO 8/1/84

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Appendix I

Accident Reports Adopted in 1984

Aviation

Operator/Aircraft	Location/Date	Adopted
McCauley Aviation Mitsubishi MU-2	Macon, GA 3/24/83	2/21/84
Eastern Airlines Lockheed L-1011	Miami, FL 5/5/83	3/6/84
Sierra Pacific Airlines DHC-6	Sun Valley, ID 2/15/83	3/6/84
Las Vegas Airlines Piper PA-31-350	Grand Canyon, AZ 8/17/83	5/15/84
Landry Aviation Lockheed Lodestar	Arlington, WA 8/21/83	5/17/84
Flying Tiger, Inc. McDonnell Douglas DC-8	Norfolk, VA 10/25/83	5/30/84
Air National Guard F4/ Beech 55	Near Cherry Point, NC 11/9/83	6/19/84
Korean Air Lines DC-10/ South Central Air Line PA 31-350	Anchorage, AK 12/23/83	7/24/84
Hughes Air Charter McDonnell Douglas DC-9	Cincinnati, OH 6/23/83	8/9/84
Air Canada Lockheed L-1011	Near Charleston, SC 11/24/83	10/17/84
Pilgrim Airlines F-27	New York, NY 1/13/84	10/18/84
Western Helicopters, Inc. Bell UH-1B	Valencia, CA 7/23/82	10/30/84
SAS McDonnell Douglas DC-10	New York, NY 2/28/84	11/15/84

Highway

Operator/Vehicle	Location/Date	Adopted
Valley Supply Company Truck Towing Farm Plows/Anchor Motor Freight Inc. Car Carrier Truck/ N.Y. Association for Retarded Children Bus, Collisions and Fire, State Route 8	Holmesville, NY 4/5/83	4/3/84

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Operator/Vehicle	Location/Date	Adopted
Samuel Coraluzzo Company, Inc. Tractor Cargo Tank Semitrailer Mechanical Failure, Overturn, and Fire, Interstate 76 (Schuylkill Expressway)	Philadelphia, PA 10/7/83	4/3/84
Trailways Lines, Inc., Bus/E.A. Holder, Inc., Truck Rear End Collision and Bus Run-Off-Bridge U.S. Route 59	Livingston, Texas 11/30/83	7/12/84
Collapse of a Suspended Span of Interstate Route 95 Highway Bridge Over the Mianus River	Greenwich, CT 6/28/83	9/5/84
Lilly of the Valley Baptist Church Bus/B&J Vacuum Tank Service Tractor Cargo Tank Semitrailer Collision; State Route 61	Devers, Texas 12/13/83	9/5/84
G&D Auto Sales, Inc., Towtruck Towing Automobile/Branch Motor Express Company Tractor-Semitrailer/Town of Rehoboth Schoolbus Collision, State Route 44	Rehoboth, MA 1/10/84	9/5/84

Railroad

Operator/Train	Location/Date	Adopted
Burlington Northern Railroad Freight Trains	Crystal City, MO 7/18/83	2/7/84
Seaboard System Railroad Freight Trains	Sullivan, IN 9/14/83	5/15/84
Seaboard Coast Line Auto Train (Revision)	Florence, S.C. 2/24/78	6/27/84
Seaboard System Amtrak Passenger Train	Rowland, N.C. 8/25/83	8/9/84
Illinois Central Gulf Amtrak Passenger Train	Wilmington, IL 7/28/83	10/16/84
Denver & Rio Grande Western Yard Switching	Denver, CO 4/3/83	12/18/84
Formosa Plastics, Inc. Industry Tank Car Loading	Baton, Rouge, LA 7/30/83	12/18/84

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Appendix I

Marine

Operator/Vessel	Type/Location/Date	Adopted
Marine Transport Lines, Inc. U.S. Bulk Carrier MARINE ELECTRIC	Sinking Atlantic Ocean East of Chincoteague, VA 2/12/83	1/19/84
United States Coast Guard Cutter POLAR SEA and several barges	Collision Pier 37 Seattle, WA 9/10/83	3/20/84
TECO Marine, Inc. U.S. Tugboat TECO 2 and the U.S. Navy USS WILLIAM V. PRATT	Capsizing and Sinking of Tugboat during Mooring Assist Pensacola, FL 10/12/83	4/17/84
Interstate Navigation Company U.S. Passenger Ferry YANKEE and Harbell Tapper Corporation Liberian Freighter HARBELL TAPPER	Collision Rhode Island Sound RI 7/2/83	8/7/84
Gulf International Marine, Inc. U.S. Supply Vessel LAVERNE HEBERT	Capsizing Gulf of Mexico near Corpus Christi, TX 11/10/83	9/18/84
Global Marine, Inc. U.S. Drillship GLOMAR JAVA SEA	Sinking South China Sea South of Hainan Island, China 10/27/83	11/14/84
Mobil Oil Corporation U.S. Tankship MOBIL OIL	Grounding Columbia River near St. Helens, OR 3/19/84	11/20/84
Pacific Western Line U.S. Ocean Tugboat EAGLE	Capsizing and Sinking Pacific Ocean, West of Juneau, AK 10/27/83	12/10/84

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Pipeline

Operation/Material	Location/Date	Adopted
Mid American Pipeline System Liquid Petroleum Gas	West Odessa, TX 3/15/83	5/15/84
Interstate Power Company Natural Gas	Clear Lake, IA 7/12/83	5/17/84
Washington Gas Light Company Natural Gas	Fairfax County, VA 10/13/83	8/9/84
Boston Gas Company Natural Gas	East Boston, MA 9/23/83	10/16/84

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Appendix J

Special Investigation

Railroad

New York City Transit Authority
Fires in Subway System
December 10, 1984

Symposium

National Railroad Accident Investigation Symposium

Discussed with railroad, rail transit, industries, and government agencies, their roles in accident investigations conducted by the National Transportation Safety Board
Washington, D.C., July 30 - August 1, 1984

Special Investigation Report

Aviation	Adopted
National Transportation Safety Board Aviation Accident Investigation Symposium, Springfield, Virginia (NTSB/RP-84/01)	7/13/84

Safety Studies Adopted

Aviation

Airport Certification and Operations (NTSB/SS-84/02)	4/11/84
Statistical Review of Alcohol-Involved Aviation Accidents (NTSB/SS-84/03)	5/1/84

Highway

Deterrence of Drunk Driving: The Role of Sobriety Checkpoints and Administrative License Revocations (NTSB/SS-84-01)	4/3/84
Deficiencies in Enforcement, Judicial, and Treatment Programs Related to Repeat Offender Drunk Drivers (NTSB/SS-84-04)	9/18/84

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Appendix K

Summary of Responses to Proposed Rulemaking

Aviation

Reference Number	Subject	The Board
FAA-23791	Flammability Requirements for Aircraft Seat Cushions	(2-8-84) Supported the more stringent flammability performance standards but said the effective date for newly manufactured planes should be reduced from three years to one year.
FAA-23792	Floor Proximity Emergency Path Marking	(2-8-84) Supported the concept of improved escape path markings but said minimum cabin floor luminosity levels should be specified in the Notice. Suggested a reduction of the compliance period from two years to one year.
FAA-83-CE-78-AD	Airworthiness Directives Gulfstream Aerospace (Aero Commander) Models 680T, 680V, 680W and 681 Airplanes	(2-21-84) Strongly supported the proposed modification to the landing gear emergency extension system.
FAA-AC-120-XX (AWS-110)	Draft Advisory Circular on Use of Child/Infant Seats in Aircraft	(5-14-84) Requested a technical correction regarding the use of shoulder harnesses to secure child seats. Suggested the FAA strongly encourage all airlines to allow the use of approved seats on aircraft and use the new FAA hotline to respond to consumer questions or complaints on child seat use in aircraft.
FAA-23624	Flight Time Limitations and Rest Requirements for Flight Crewmembers	(5-18-84) Strongly supported efforts to simplify the rules governing air carrier and commuter operations; however, the NPRM did not present any basis for the higher flight time limitations proposed for flight crewmembers. The proposed flight time limitations for nonscheduled flight crew members will provide no practical safety benefit. The NPRM overlooked flight time limitations and rest periods for Flag Air Carrier or Supplemental Air Carrier certificates which should have been evaluated simultaneously.
FAA-84-ANE-4	Airworthiness Directives, Pratt and Whitney Aircraft Model JT8D-15, -17, and -17R Turbofan Engines	(6-27-84) Believed the proposed modification and inspection requirements for these turbofan engines are needed to preclude catastrophic failure of the disk and possible secondary damage resulting from a ruptured disk.

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FAA-84-CE-13-AD	Airworthiness Directives, Cessna 402C, 404, 414A, 421C, 425, and 441 Airplanes	(7-16-84) Supported the proposed AD and felt it would be effective in preventing further accidents resulting from incorrectly manufactured nose landing gear rod ends.
FAA-24073	Airplane Cabin Fire Protection	(9-14-84) Fully supported proposals to require smoke detectors in each lavatory and galley, halon hand fire extinguishers in transport cabins, and automatic discharge extinguishers in each lavatory trash receptacle. Suggested that halon automatic extinguishers should be required to discharge both in and adjacent to the lavatory trash receptacles.
FAA-84-CE-17-AD	Airworthiness Directives, Piper Models J-3, J-4, J-5, PA-11, PA-12, PA-14, PA-15, PA-16, PA-17, PA-18, PA-18A, PA-20, and PA-22 Series Airplanes	(9-27-84) Concurred with the proposed AD, which required fuel tank quick drains, believing it would decrease the number of accidents involving water in the fuel.
FAA-AC-20-XX	Advisory Circular on Installation of Plastic Foam and Metallic Mesh in Fuel Tanks of Helicopters and Small Airplanes	(9-28-84) Requested that FAA not issue the AC unless more definitive tests can demonstrate the fire suppression benefits (attenuation of outflow or atomization from breached tanks) during impact.
FAA-24185	Fire Protection Requirements for Cargo or Baggage Compartments	(10-9-84) Urged that a fire detection system be required for Class D cargo compartments so that flightcrews will be alerted to a fire.
FAA-24191	Standardization of Cockpit Controls for Small Airplanes	(10-11-84) Supported standardization to reduce design-induced pilot error accident rates; however, urged that the same standardization be applied to fuel selector valve location and direction of movement.
FAA-84-CE-19-AD	Airworthiness Directives, Cessna 205, 206, P206, U206, TP206, TU206, 207, T207, 210, P210, and T210 Series Airplanes	(10-17-84) Strongly supported the AD modifying the fuel selector valve and yoke assembly, so that the rollpin, which secures the yoke to the shaft, will be securely retained.
FAA-84-CE-25-AD	Airworthiness Directives, Paper Induction Air Filters	(10-26-84) Supported the AD imposing a service life limit of 500 hours on the paper filters, which have been known to disintegrate and clog the carburetion system, causing power loss.

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FAA-84-CE-26-AD	Airworthiness Directives, Beech Models 65-88, 65-90, 65-A90, B90, C90, E90, 100, A100 and B100 Airplanes	(11-14-84) Supported the AD for removal of existing cast acrylic windows and replacement with stretched acrylic windows within one year. This AD fulfills Safety Recommendations A-81-21 and 22, issued in March 1981.
FAA-84-CE-27-AD	Airworthiness Directives, Piper PA-20, PA-22, PA-23, PA-24, PA-25, PA-36, PA-44 Series and All Models PA-30, PA-31P and PA-39 Airplanes	(11-14-84) Supported the AD requiring installation of a brake operation warning placard, and asked FAA to review the braking systems of other Piper models to determine if they are subject to the same conflict between parking and toe brakes, which may render the toe brakes ineffective.
FAA-84-CE-31-AD	Airworthiness Directives, Beech Models A23-19, 19A, M19A, B19, 23, A23, A23A, B23, C23, A23-24, A24, A24R, B24R, and C24R Airplanes	(11-16-84) Strongly supported the proposed AD modifying the fuel selector valve to prevent or reduce possibility of inadvertent selection of "off" detent position. Previously, modifications correcting this problem were not mandatory.
FAA-84-CE-32-AD	Airworthiness Directives, Cessna 205, 206, P206, U206, TP206, TU206, 207, T207, 210, and T210 Series Airplanes	(11-26-84) Concurred with the AD requiring inspection and modification or replacement of engine throttle and mixture controls. Fatigue cracking of the linkage and separation of the control shaft has resulted in loss of engine power.
FAA-84-CE-33-AD	Airworthiness Directives, Fairchild Aircraft Corporation Models SA26-T, SA26-AT, SA226-T, SA226-T(B), SA226-AT, SA226-TC Airplanes	(12-4-84) Expressed belief that the risk of a cockpit fire, which could result from a leak in the hydraulic and oxygen systems, would be significantly reduced by the proposed modifications.
FAA-24309	Anti-Misfueling: Tank Filler Opening Adapters	(12-18-84) Supported GAMA actions to prevent engine damage and accidents caused by inadvertent fueling of planes requiring aviation gas with jet fuel. Also, supported FAA's action to encourage owners and operators to install anti-misfueling devices in their planes voluntarily.

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	FAA-84-NM-99-AD	Airworthiness Directives, McDonnell Douglas Model DC-9 and C-9 (Military) Series Airplanes, Fuselage Numbers 1 Through 855	(12-18-84) Supported the AD requiring rerouting of the toilet flush motor power wire harness in the lavatories; possible exposure of harness to conductive "degerm" fluids used in the toilet creates ignition risk.
Highway	FHWA-84-9	Skid Accident Reduction Program	(9-24-84) Strongly urged FHWA to initiate and complete a study to determine if the 1983 wet pavement accident rate increase is related to weather or data collection changes; expressed concern that skid testing may have been reduced to a miniscule part of some States' pavement management programs; urged greater emphasis on this topic by FHWA.
	FHWA-84-18	Truck Size and Weight; Automobile Transporters	(12-3-84) Urged FHWA not to permit, for economic convenience, a change which might worsen truck jackknifing; urged thorough evaluation of stinger-steered hitch to determine safety implications at highway speeds.
	NHTSA-84-12	Federal Motor Vehicle Safety Standards, Lamps, Reflective Devices, and Associated Equipment	(12-10-84) Suggested NHTSA first conduct a controlled fleet study to determine effects of flashing vs. steady burning clearance and identification lamps on motor vehicles greater than 80 inches in overall width.
	UMTA 84-0	Extension of Safety Requirements to all Federally Assisted Buses	(12-18-84) Expressed belief that the extension of requirements to all buses purchased by UMTA grantees is a significant safety improvement.
Railroad	FRA-RSOR-6	Control of Alcohol and Drug Use in Railroad Operations; Notice of Proposed Rulemkaing	(8-15-84) Supported intent of proposal and suggested improvements and clarification of the final rule.
	FRA-RSSI-84-3	Special Safety Inquiry: Rail-Highway Grade Crossing Safty	(8-28-84) Reiterated concerns contained in more than 91 recommendations issued over the past 15 years; urged FRA's continued support of "Operation Lifesaver."

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Marine	CGD 83-026 (ANPRM)	Fire Protection Regulations	(11-29-84) Supported proposal to incorporate SOLAS fire protection amendments in the USCG regulations which will consolidate all fire regulations in a single subchapter; urged that regulations authorize the use of Halon 1301 extinguishing systems as well as currently authorized systems.
Hazardous Materials	MTB-HM36B	Detailed Hazardous Materials Incident Reports	(6-5-84) Suggested clarification and improvement of reporting procedures; encouraged further work on development of data analysis plan to define intended uses and users of the data.
	MTB-HM166R	Shipment of Hazardous Materials, Proposed Miscellaneous Amendments	(6-29-84) Expressed concern about inappropriate classifications of materials; restated previous recommendations that MTB conduct systematic review of classifications to be certain all materials are properly classified.
	MTB-HM126C	Required Use of Emergency Response Guidebooks and Material Safety Data Sheets	(7-11-84) Stated that threshold and lethal concentration values would be useful in determining adequacy of evacuation areas and other emergency response actions; CHEMTREC information should never be considered an alternative to on-scene, material-specific data sheets, since CHEMTREC cannot be accessed immediately from accident site; emergency response personnel should be provided with a chemical name of "N.O.S." materials.
	MTB-HM180	Placarding of Empty Tank Cars	(11-6-84) Supported proposed changes in placarding and consist information if accompanied by mandatory training of emergency and railroad operating personnel.

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